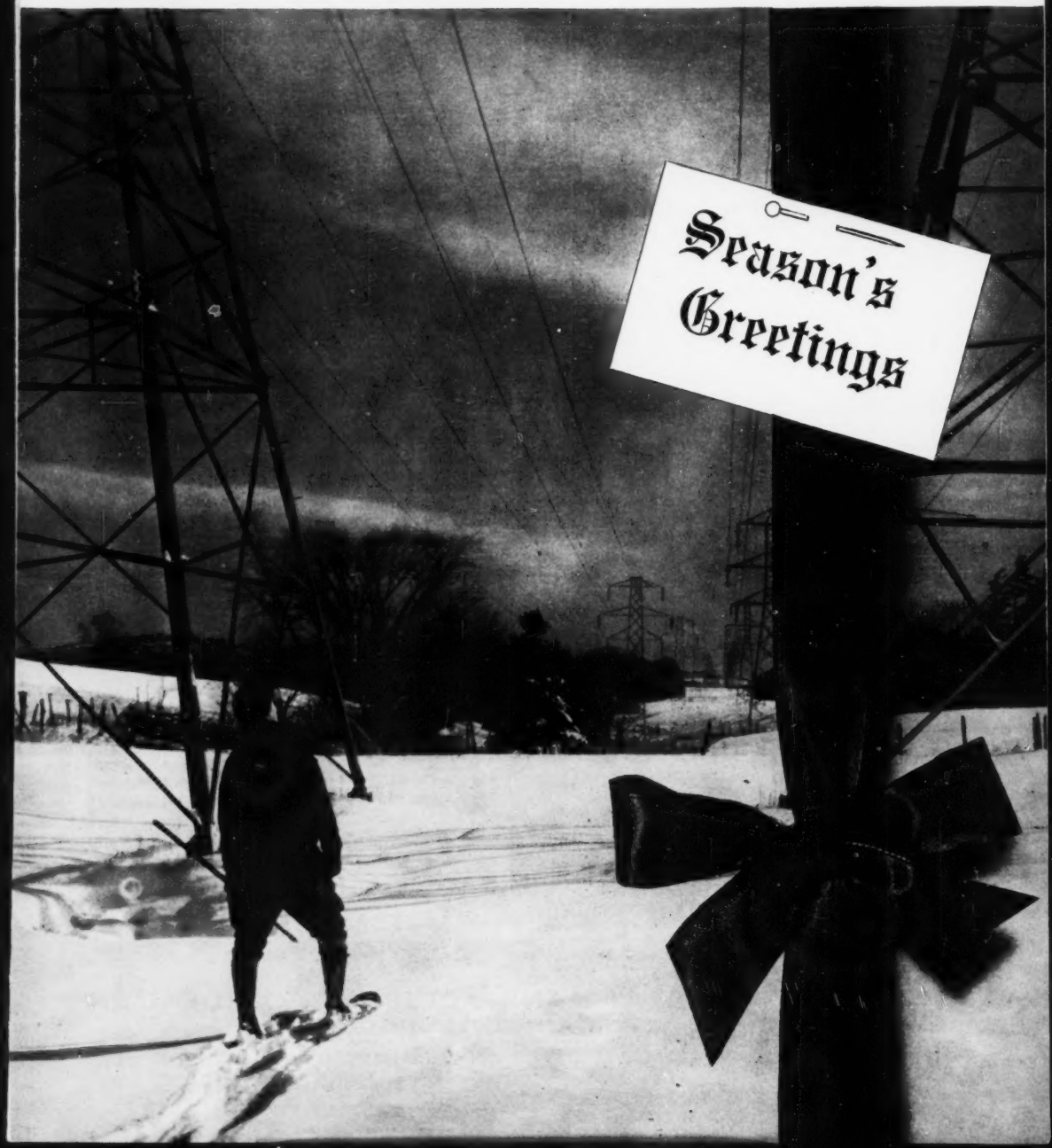
DECEMBER 17, 1951

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



55 AMPERE CIRCUIT BREAKER SERVICE CONTROL

...ALWAYS CARRIES FULL LOAD

Another NEW Murray Product

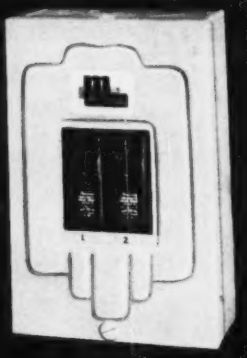
that gives you

Fully Magnetic

circuit protection

Fully Magnetic Circuit Breakers always carry their full rated load—never need derating. The magnetic principle of operation is not affected by changes in temperature.
Murray Breakers give three way circuit protection.

1. Timed delay to carry harmless overloads.
2. Timed tripping on dangerous overloads.
3. Immediate tripping on short circuits.



MANY ADVANTAGES

1. Fully Magnetic Circuit Protection.
2. Solderless connectors, and ample wiring room make it EASY TO INSTALL.
3. Seven concentric KO's—where you need them.
4. Easy to gang (no side handles).
5. Compact 7⅜"x 4⅞"x 3-11 16" (Surface type).
6. Also available in flush.

WHAT IS IT?

Service Control equipment with 55 ampere main capacity and two—50 ampere single pole Fully Magnetic Circuit Breakers. Supplied with handle extension for simultaneous manual tripping. Available in surface or flush. Listed by Underwriters' Laboratories, Inc.

HOW IS IT USED?

1. In place of a comparable 60 ampere fused switch.
2. As service entrance equipment.
3. As a main disconnect.
4. For protecting single phase lighting and appliance circuits or for fractional horse power motor circuits.
5. For protecting electric range circuits.
6. For use on 2 wire, 250 volt service without neutral or; 3 wire 125-250 volt wiring with neutral or 2 wire 125 volt with neutral.

IS IT AVAILABLE?

YES—immediate shipment—see your electrical distributor or write the factory—specify catalog number LC002H.

One Of The Family

Another addition to Murray's growing Circuit Breaker equipment line. Others include —The 2 circuit 40 amp and 100 amp, the "6", the "8", the "12" and the "20" Circuit Protectors. Panel boards up to 42 branch circuits.

50 YEARS OF SERVICE TO THE ELECTRICAL INDUSTRY

For detailed information, write:

Murray®

MURRAY MANUFACTURING CORPORATION
1250 ATLANTIC AVENUE · BROOKLYN 16, N.Y.

Service Entrance & Meter Equipment · Magnetic Circuit Breakers · Switches · Current Limiting Reactors · Crows' Nest Aerial Ladders

THINGS TO COME

As years have a habit of doing at this season, 1951 is drawing rapidly to a close. People everywhere are turning their attention to the new year. Predictions are in the air as industry after industry takes a long look at its problems and prospects.

As its contribution, Electrical World has asked a picked group of utility executives for their opinion of what next year holds in store for the electric light and power industry.

They will tell us what hopes they see in the future, what threats hang over the industry, where growth will come from and how it will be met, how much money will be spent and for what.

So if you're interested in what's ahead in 1952; if you want to check your own predictions against the experts, watch for the December 31 issue of Electrical World.

COMPENSATED SECONDARY METERING

Most electric companies like to meter large power loads on the high side of power transformers. But there are other companies who don't.

These prefer to do their metering on the customer's side of the transformer and use a compensating device to add losses to the meter.

Those that like this method say it cuts down lightning hazards and saves material. But first and foremost they claim it costs less to install.

With curves and numerical examples, in the next issue, George Schleicher of Philadelphia Electric Co proves this point in his article, "How To Determine Savings From Compensated Secondary Metering."

JUDGES AND ANNUAL REPORTS

More and more work, these days, is going into the preparation of the annual reports that are the vital communication link between a company and its investors; that tell them what their company is doing.

Is all this effort well directed? What is it that makes a "good" annual report "good"? What is it that gets the best reports read by bakers and bankers alike with equal interest? Is it the charts? The pictures? The balance sheet? Or the way they are presented.

If you really want to know, watch for "What Judges Look for In Annual Reports," in your next issue.

Electrical World

Published for 77 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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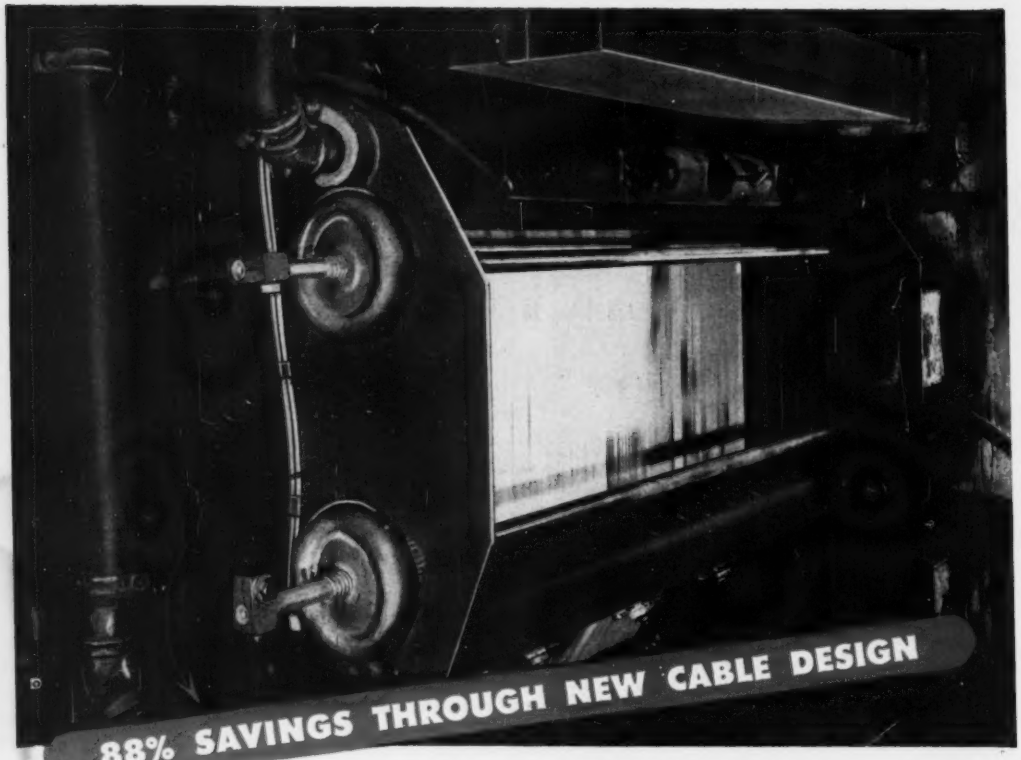


How Okonite-engineered cables save money for the McCall Corporation

Engineers of the McCall Corporation, Dayton, Ohio, sought a means of reducing their insulated cable replacements on six printing presses. The ordinary cables used for supplying the gas ignition apparatus failed quickly because of temperatures ranging from 350 to 450°F. Monthly replacements of the standard rubber-insulated automotive ignition cable previously used gave rise to the following costs:

BEFORE

Cost of cable per year	**$650.00**
Labor in replacement	**900.00**
Yearly cost: materials and labor	**$1550.00**

In 1948, at the suggestion of an Okonite engineer, McCall installed Okonite's heat-resistant Okotherm cable. Since then, no replacements have been made under conditions of normal usage. Although the Okotherm cable was several times as expensive, experience has already shown that annual costs have been reduced to a mere fraction of the previous cost, as follows:

NOW

Cost of cable per year	**$142.00**
Labor on installation	**37.50**
Total yearly cost using Okotherm	**$179.50**

...a saving of 88.5%

• • •

Stories like this are not unusual in the file of actual case histories at Okonite. For the broad research and design and manufacturing skills which have developed such long-lived, trouble-free cables for normal use, have also developed many types for highly specialized applications.

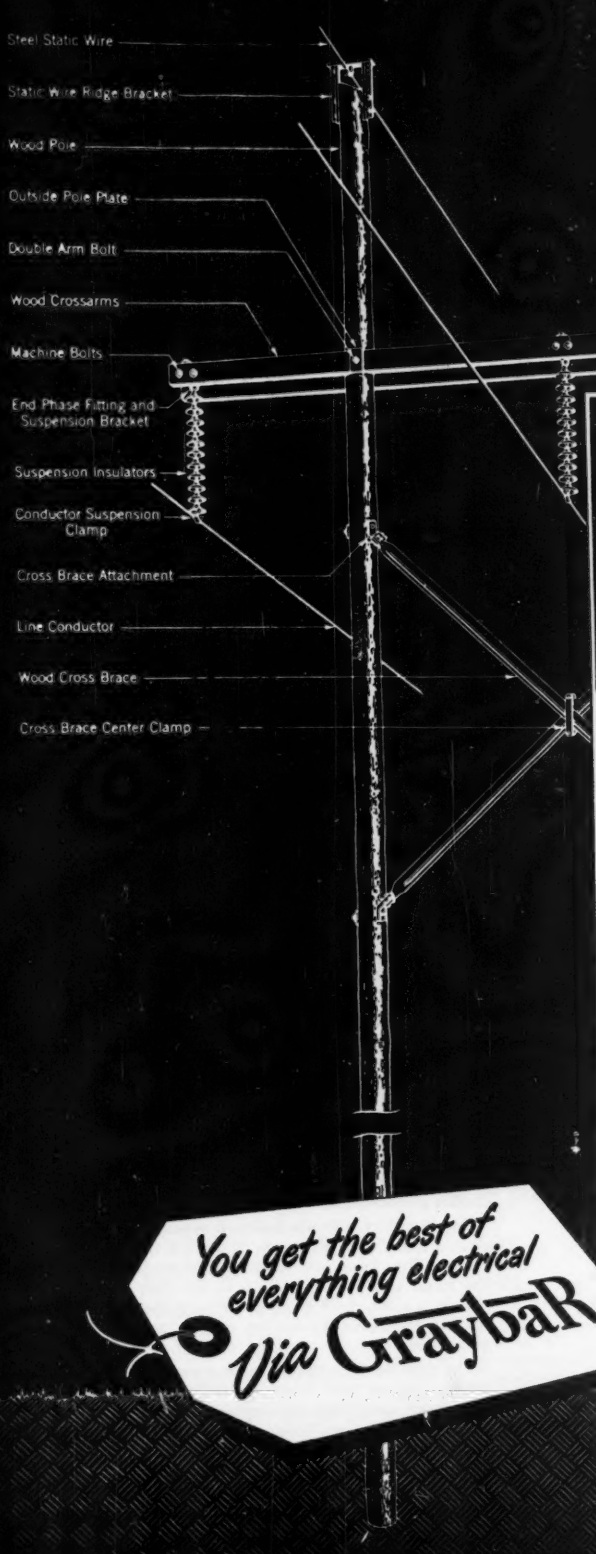
These facilities are available to *you*, to help solve any difficult cable problems arising in *your* operation. Don't hesitate to call in your nearest Okonite representative, or write The Okonite Company, Passaic, N. J.

OKONITE OKONITE SINCE 1878

THE BEST CABLE IS YOUR BEST POLICY

insulated wires and cables

9184



From a single near-by source

Everything for Transmission Lines

— AND ALL OTHER LINES

From near-by Graybar you can fill all your transmission-line material and supply requirements with just one order — and be sure you're getting dependable items. You save time and expense. You get the products of leading manufacturers of poles, crossarms, insulators, hardware, strand, line trucks, and tools.

When you call Graybar, for supplies or for information, your needs are understood and accurately met. That's because Graybar has been familiar with pole-line requirements ever since the first lines went up.

Your local Graybar Representative is ready to provide product and delivery information about any of the more than 100,000 electrical items Graybar distributes. In addition, a Graybar Outside Construction Specialist is ready to apply his knowledge, gained through years of specialized experience, in helping you to solve unusual transmission-line problems of all types. He will also be glad to work with you in solving problems that come up in planning other line construction, maintenance, or underground projects. *Graybar Electric Company, Inc. Executive offices: Graybar Building, New York 17, N. Y.*

116-912

IN OVER 100 PRINCIPAL CITIES

You get the best of everything electrical

Via GraybaR

Get Full Electrical

WITH MECHANICALLY TRIP-FREE PNEUMATIC OPERATION

YOUR CIRCUIT BREAKER is a long term investment that pays dividends daily in protection for your electrical system. Naturally, you want full electrical protection — the best protection your money can buy. That's an important reason why your pneumatically operated circuit breakers should be mechanically trip-free. Unless they're mechanically trip-free they may fail to reopen properly when closed against a fault condition.

TRIP-FREE ADVANTAGES

Opening action of Allis-Chalmers pneumatically operated breakers is immediate and positive, because tripping instantly uncouples contacts from the closing mechanism. Opening occurs whether the breaker is in normal closed position or is "closing in" on a short circuit.

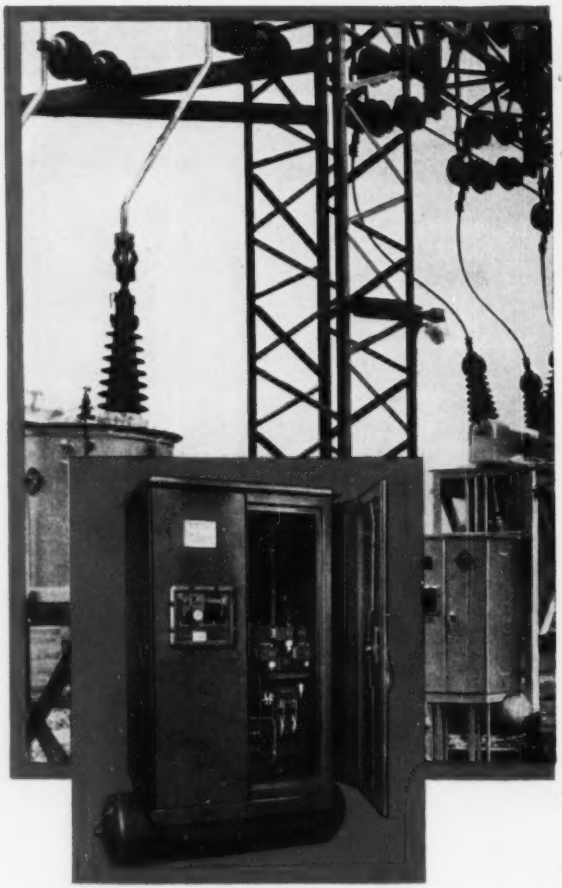
Breaker opening is independent of the closing piston and air valves. There is no drag from the closing mechanism.

Designed for high speed (20 cycle) reclosing, these breakers combine fast acting power of pneumatic operation with fast recoupling of contacts and reclosing mechanism. Stored energy for fast closing comes from a self contained air pressure tank with compressor.

You can gain the advantages of mechanically trip-free operation in every Allis-Chalmers power oil circuit breaker — whether pneumatically, solenoid or manually operated. It is standard in all sizes and ratings.

More than one-half century of experience stands behind the dependable operation of these breakers, serving industry since 1899. This dependability is being proved daily in utility and industrial installations coast to coast.

Call your Allis-Chalmers district office for more information on power oil circuit breakers. Or write Allis-Chalmers, Milwaukee 1, Wis., for your copy of the mechanically trip-free pneumatic operator bulletin. A-3355



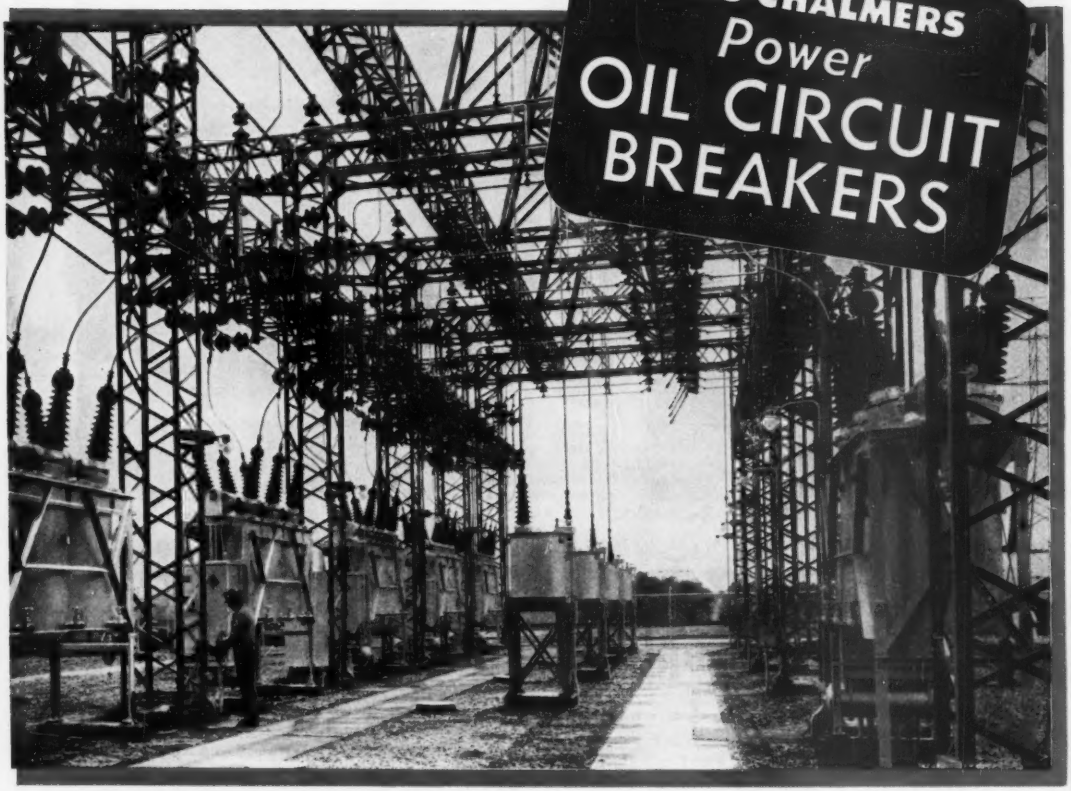
Weatherproof operator housing furnishes double protection against moisture.

For keeping out wind-driven weather, double doors with full length hinges are recessed. They have provisions for gasketing. The large safety glass window in the door permits a quick check of air pressure gauge, position indicator, operation counter and nameplate.

The operator is protected against condensation. The air tank is outside of housing. Thermostat controlled electric heaters keep both the operator and housing interior above ambient temperature. All parts are rustproof.

Protection

ALLIS-CHALMERS
Power
OIL CIRCUIT BREAKERS



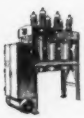
These FZO-151 circuit breakers are equipped with the reliable mechanically trip-free pneumatic operator. The *Ruptor* interrupting device and many other important features also contribute to your assurance of positive operation. The FZO-151 is rated 69 kv up to 3,500,000 kva with 8 to 5 cycle opening, 20 cycle reclosing.

Ruptor and *Unitop* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

MECHANICALLY TRIP-FREE PNEUMATIC OPERATOR IS STANDARD EQUIPMENT ON ALL THESE ALLIS-CHALMERS OUTDOOR POWER OIL CIRCUIT BREAKERS



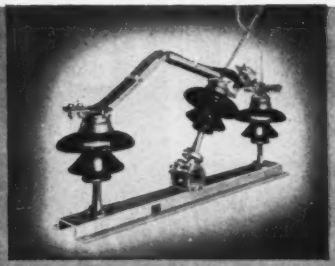
Type FZO-150 *Unitop* breaker 14.4 to 46 kv, 8-cycle opening, 20-cycle reclosing*

Type FZO-151 . . . 69 kv, 5 or 8-cycle opening, 20-cycle reclosing*

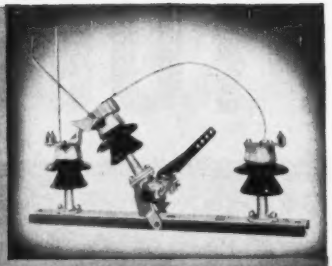
Type BZO-160 . . . 69 kv, 8-cycle opening, 115 to 230 kv — 3 or 5-cycle opening with 20-cycle reclosing*

*20-cycle reclosing standard for 600 and 1200 amp breakers

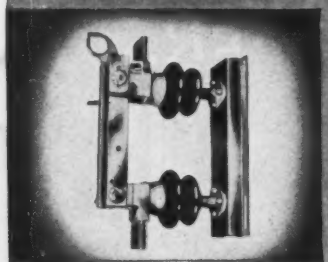
Type V—Outdoor, Group-Operated 7.5 to 230-kv, 400 to 4,000 amperes.



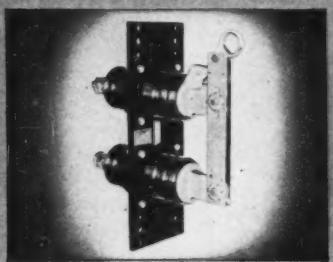
Type SW—Outdoor, Group-Operated 7.5 to 34.5-kv, 400 to 1,200 amperes.



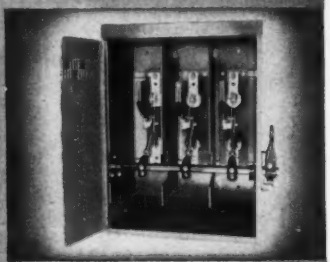
Type SWR—Ourdoor, Group-Operated 7.5 to 15-kv, 200 amperes.



Type LCO—Outdoor, Hookstick-Operated. 7.5 to 161-kv, 400 to 2,000 amperes.



Type LC—Indoor, Hookstick and Group-Operated. 2.5 to 34-kv BIL, 200 to 6,000 amperes.



Type LCB—Indoor, Group-Operated 2.5 to 15H-kv BIL.

Now... *FEATURES YOU ASKED FOR* in this complete Switch Family!

Type RL—Outdoor, Group-Operated 7.5 to 161-kv, 400 to 1,200 amperes. This unit now matches Type V design advantages, having fewer parts and shuntless construction.

Every switch in this complete "family" incorporates features suggested by you—the switch user. We've extended shuntless construction; made them easier to install . . . more dependable in operation . . . less costly to maintain. And they're available in seven different types to cover all of your switching requirements.

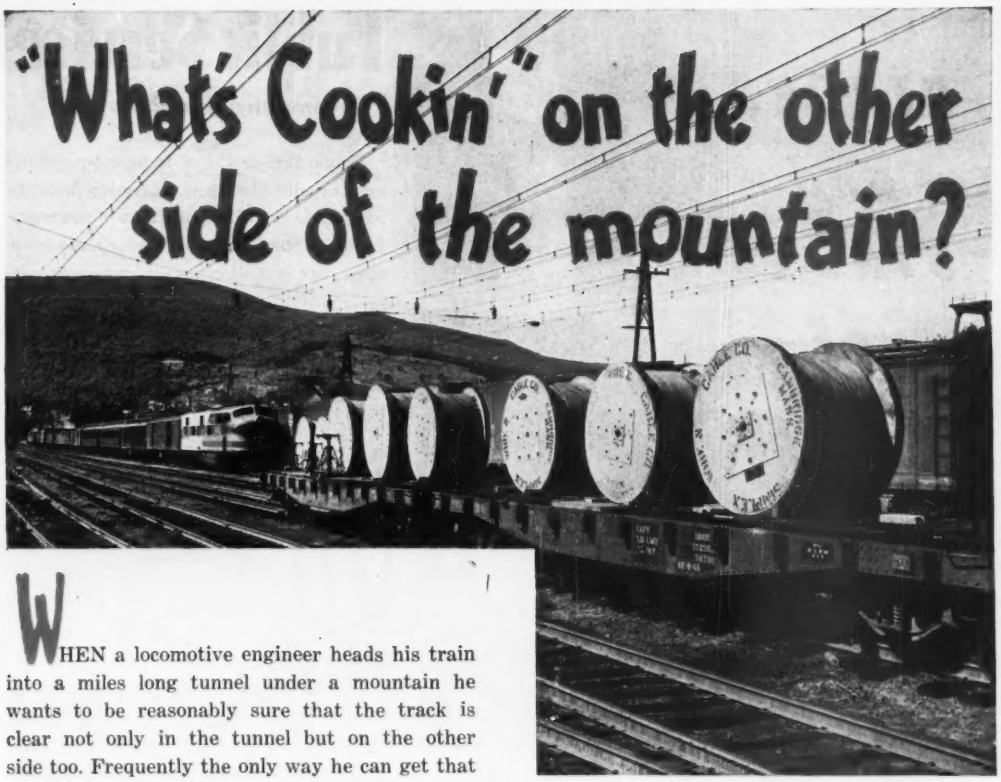
For complete information ask for a copy of Booklet B-4726. Call your nearest Westinghouse Office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60753

YOU CAN BE SURE.. IF IT'S

Westinghouse

DISCONNECTING SWITCHES

"What's Cookin'" on the other side of the mountain?



WHEN a locomotive engineer heads his train into a miles long tunnel under a mountain he wants to be reasonably sure that the track is clear not only in the tunnel but on the other side too. Frequently the only way he can get that information is through signal systems. When they are sitting on a siding signal cables may not look like much but once they are installed and connected they are a most important piece of equipment to a locomotive engineer.

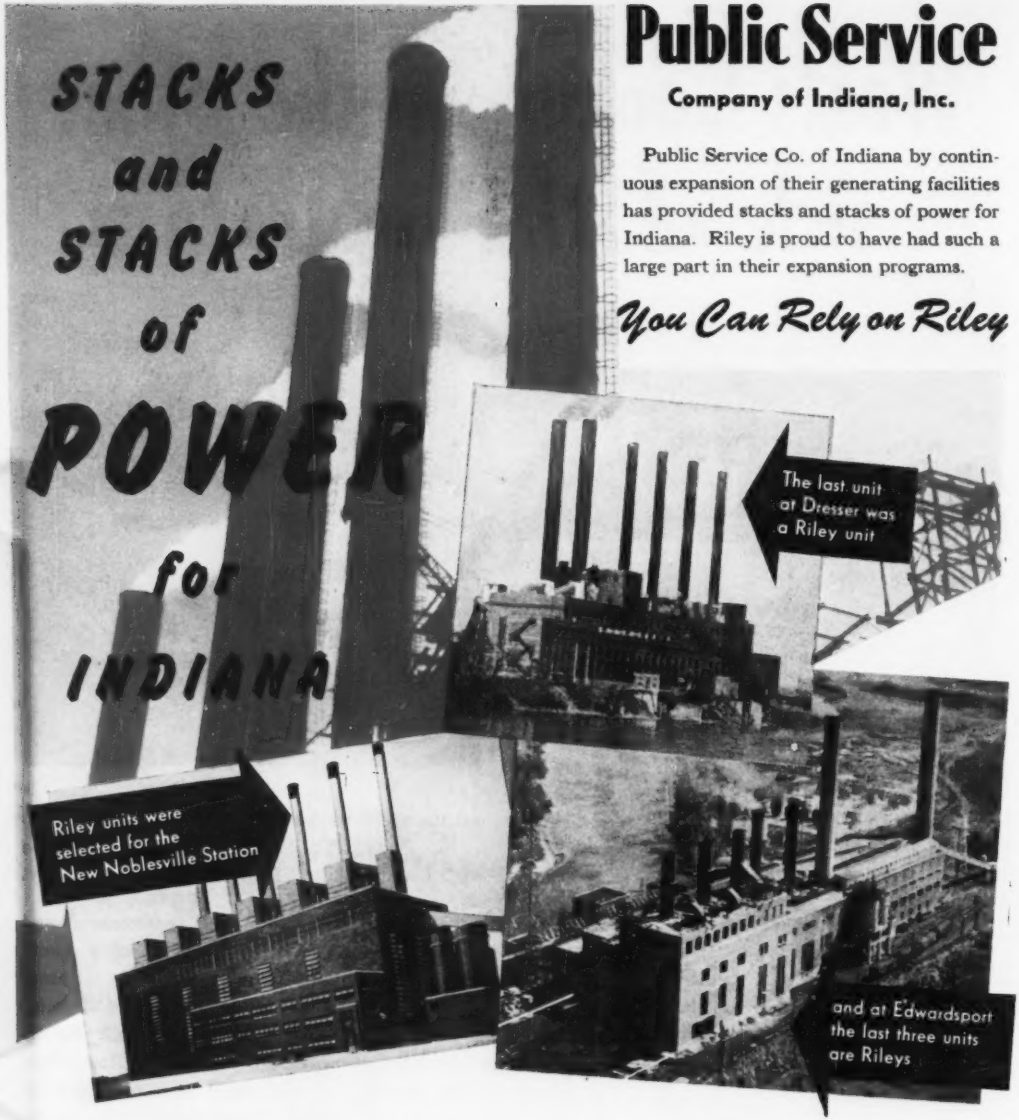
Railroad Signal Cables carry a heavy burden of responsibility for the safety of passing trains. For that reason Railroad Signal Engineers are more often than not apt to be very "choosy" about the kind of signaling equipment they buy and install. More and more these days you will see Simplex-ANHYDREX Signal Cables like these being installed by railroads all over this country.

These cables are installed underground and overhead, in tunnels or in bright burning desert sunlight, on signal bridges across busy terminal tracks or buried in the slime and mud of swampy land. Why this trend to ANHYDREX Signal Cables? Because they are dependable. Regardless of the operating conditions if they are properly installed ANHYDREX Signal Cables will operate dependably year in and year out.

If you have a power, signal or control cable problem we will be glad to discuss it with you and make recommendations based on nearly seventy years experience.

SIMPLEX-ANHYDREX

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.



Public Service

Company of Indiana, Inc.

Public Service Co. of Indiana by continuous expansion of their generating facilities has provided stacks and stacks of power for Indiana. Riley is proud to have had such a large part in their expansion programs.

You Can Rely on Riley

TRADE MARK Rx REGISTERED

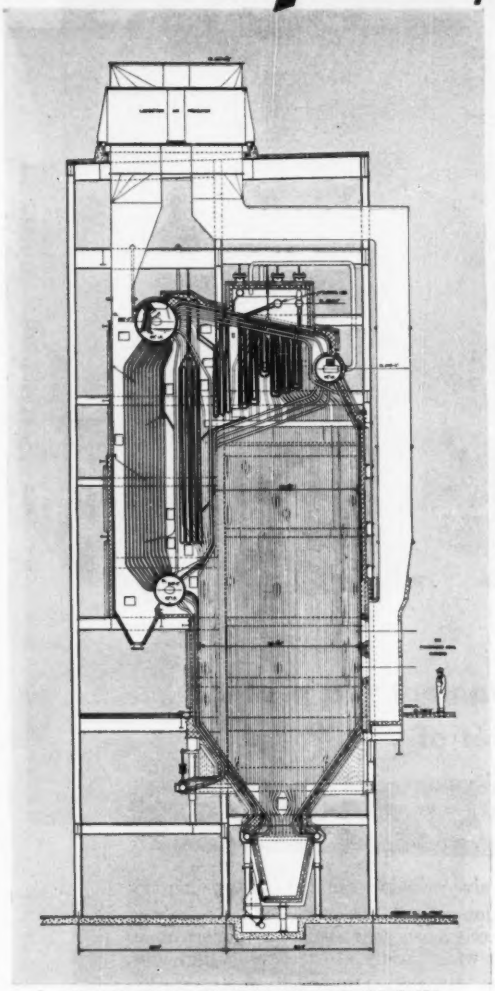
RILEY

STOKER CORPORATION, WORCESTER, MASS.

Boston New York Philadelphia Washington Buffalo Pittsburgh Cleveland Detroit Chicago
Cincinnati Atlanta New Orleans St. Louis Kansas City St. Paul Tulsa Houston Denver
Salt Lake City Los Angeles Portland Seattle

BOILERS • PULVERIZERS • BURNERS • STOKERS • SUPERHEATERS • FLUE GAS SCRUBBERS

Installed 7 Riley Units Since 1947



PUBLIC SERVICE COMPANY OF INDIANA
NOBLESVILLE STATION
3—300,000 lbs./hr. Riley Units
1025 psig—950°F. Temperature

Public Service Company of Indiana Selected Riley Steam Generating Units for their latest additions to Dresser and Edwardsport Stations and also for their new Noblesville Station. Sargent and Lundy were Consulting Engineers.

Riley History of Public Service Co. of Indiana

First Order—July-1946
1—300,000 lbs./hr. Riley Unit for Dresser Station

Second Order—Sept.-1946
2—400,000 lbs./hr. Riley Units for Edwardsport Station

Third Order—July-1947
3—300,000 lbs./hr. Riley Units for Noblesville Station

Fourth Order—March-1949
Another 400,000 lbs./hr. Riley Unit for Edwardsport Station

Total 4 orders—7 Units—Total Capacity 2,400,000 lbs./hr.

All of these Public Utilities have Purchased Riley Steam Generating Units.

Monongahela Power Co.
Houston Lighting & Power Co.
Iowa Electric Light & Power Co.
Utah Power & Light Co.
S. Carolina Elec. & Gas Co.
Union Electric Co. of Illinois
Southwestern Public Service Co.
New Orleans Public Service Co.
Gulf Power Co.
Florida Power & Light Co.
Ohio Edison Co.
Southern Ind. Gas & Elec. Co.
Interstate Power Co.
Upper Michigan Power & Light Co.
Central Ohio Light & Power Co.
Natrona Power & Light Co.
Cambridge Electric Light Co.
West. Colorado Power Co.
Newport Electric Co.
Northwestern Public Service Co.
S. Carolina Public Service Authority
The Potomac Edison Co.
Northern States Power Co.
Arkansas Power & Light Co.
Central Illinois Light Co.
Public Service of Indiana
Northern Virginia Power Co.
Carolina Power & Light Co.
Worcester County Electric Co.
Penn. Electric Co.
Iowa-Illinois Gas & Electric Co.
Mississippi Power Co.
Lynn Gas & Electric Co.
West Penn. Power Co.
Superior Water, Light & Power Co.
Ottertail Power Co.
Cliffs Power & Light Co.
Washington Water Power Co.
Iowa Public Service Co.
N. Dakota Power & Light Co.
Missouri Utilities Co.
City of Los Angeles Water & Power

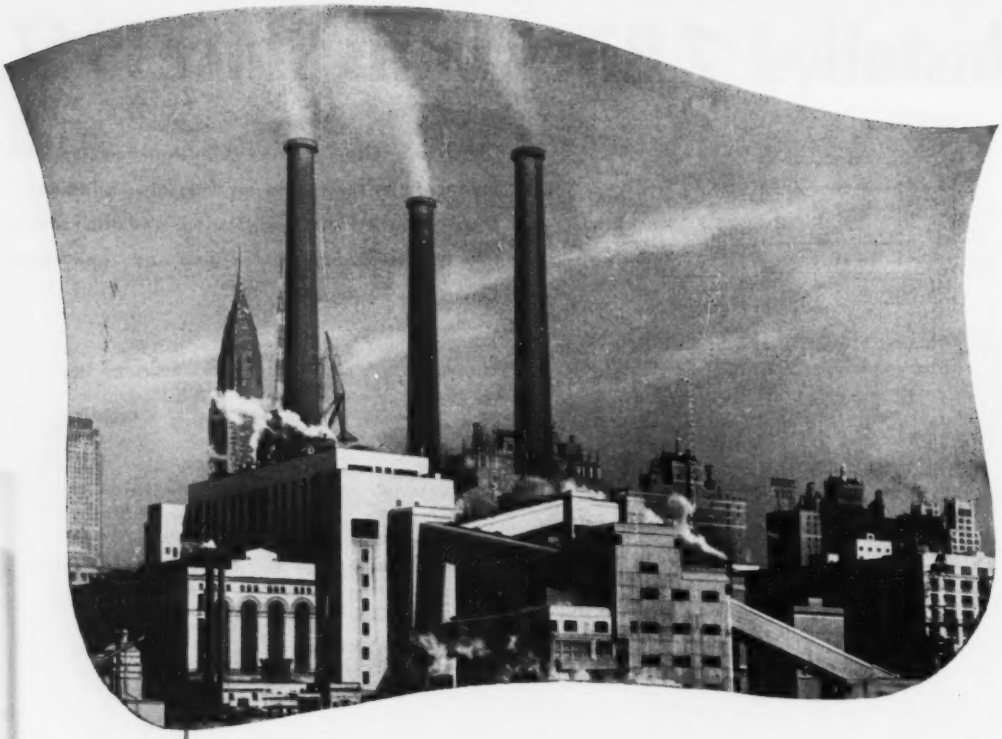
It will pay you to consider Riley equipment because Riley gives you more for your money.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS



Whatever equipment you prefer, here's the secret of

LOW-COST POWER

When choosing your fuel, always keep these three factors in mind:

1. ***The types available.*** Along the Baltimore & Ohio, you're sure to find the type that exactly meets your needs. The modern mines in this area produce a wide variety of excellent Bituminous.
2. ***Nearness to your plant.*** With its 11,000 miles of track, the B&O offers efficient economic transportation to plants throughout the heart of industrial America.
3. ***Reserves on hand.*** Virtually limitless reserves of power-packed Bituminous lie in the vast B&O territory—a supply that will last for centuries.

For the secret of dependable, low-cost power as related to your specific needs, *ask our man!*

Bituminous Coals for Every Purpose

LINKING 13 GREAT STATES WITH THE NATION — B&O

BALTIMORE & OHIO RAILROAD

Constantly *doing things* **—better!**

This message is for you...

HAVING UNUSUAL PROBLEMS WHICH REQUIRE SPECIAL DESIGNS OF CABLE TROUGH

T.J. Cope INC.

YOU KNOW COPE BY THESE PRODUCTS

There are many cases where installation of cable trough creates this "puzzling problem": *How* should it be designed to fit a particular situation?

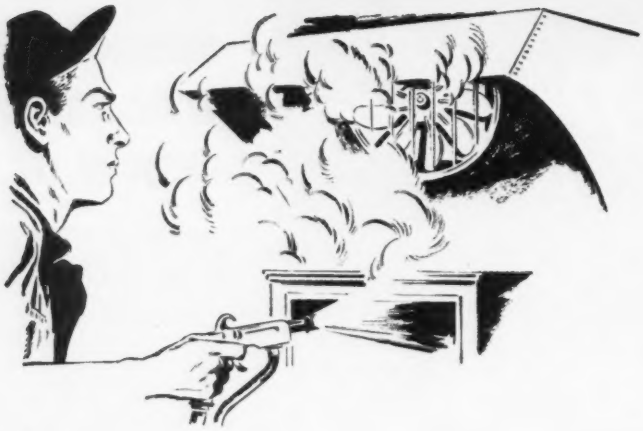
That needn't cause you any worry, though, because Cope is solving such individual problems daily. Where a Design Engineer is concerned over a "perplexing situation", all he has to do is outline the problem to our Engineering Staff, and the solution comes from us. Cope Engineers design special fittings which adapt the standard Troughs to your specified job.

We offer you the services of our Engineers when special fittings are required, and urge you to submit your problems to us.

You will quickly discover—as have hundreds of users—that the new Cope Cable Trough with its simplified design actually saves you *three ways*: material, labor and costs.

Request full information on Cope Cable Trough from us today.

T. J. COPE, INC., 711 SOUTH 50th ST.
PHILADELPHIA 43, PENNSYLVANIA



"A rush job . . . . . stopped!"

Two o'clock in the afternoon . . . production clicking along like a through express. Only forty more television cabinets to be sprayed by 4:30. The new exhaust fan in Booth 3 was whirring along at a great rate, keeping the air fresh and fume free. Then . . . it stopped! That did it — no exhaust — no work — because of health and fire regulations. Took quite awhile to find the trouble. Turned out that the electrical insulation on the brush shunt lead of the fan motor had stiffened — it couldn't take the heat. Just another case where a few cents "saving" in manufacturing costs made a big difference in performance.

Electrical insulation is minor in cost and major in product performance. This is why BH Special Treated Fiberglas Sleeving has found wide acceptance in the electrical industry. Its ability to withstand heat, up to 1200° F, and cold as well, below -67° F, makes it dependable electrical insulation for long service.

Add the features of permanent flexibility —special patented treatment to prevent fraying, without the use of a saturant— easy spreadability to cover knobs, terminals and irregularities—tubular shape for easy handling and rapid installation—and you have electrical insulation adaptable to a wide range of home, industrial and laboratory equipment.

BH Special Treated is one of a family of BH insulations, each designed to meet particular conditions in service. Give us a few facts about your requirements—product, temperatures, voltages. We will furnish production samples for testing. *Address Dept. W-12*

Bentley, Harris Manufacturing Co.
Conshohocken, Pa.

BH *Fiberglas** SLEEVINGS

*BH Non-Fraying Fiberglas Sleevings are made by an exclusive Bentley, Harris process (U. S. Pat. No. 2393530). "Fiberglas" is Reg. TM of Owens-Corning Fiberglas Corp.

FOR CONSTRUCTION AND ALL-SEASON MAINTENANCE

Choose FWD, the truck that does more work

"We lick more service jobs per day with FWDs because they move safely and easily over any terrain, year 'round . . . bringing all our equipment *right to the work spot.*"

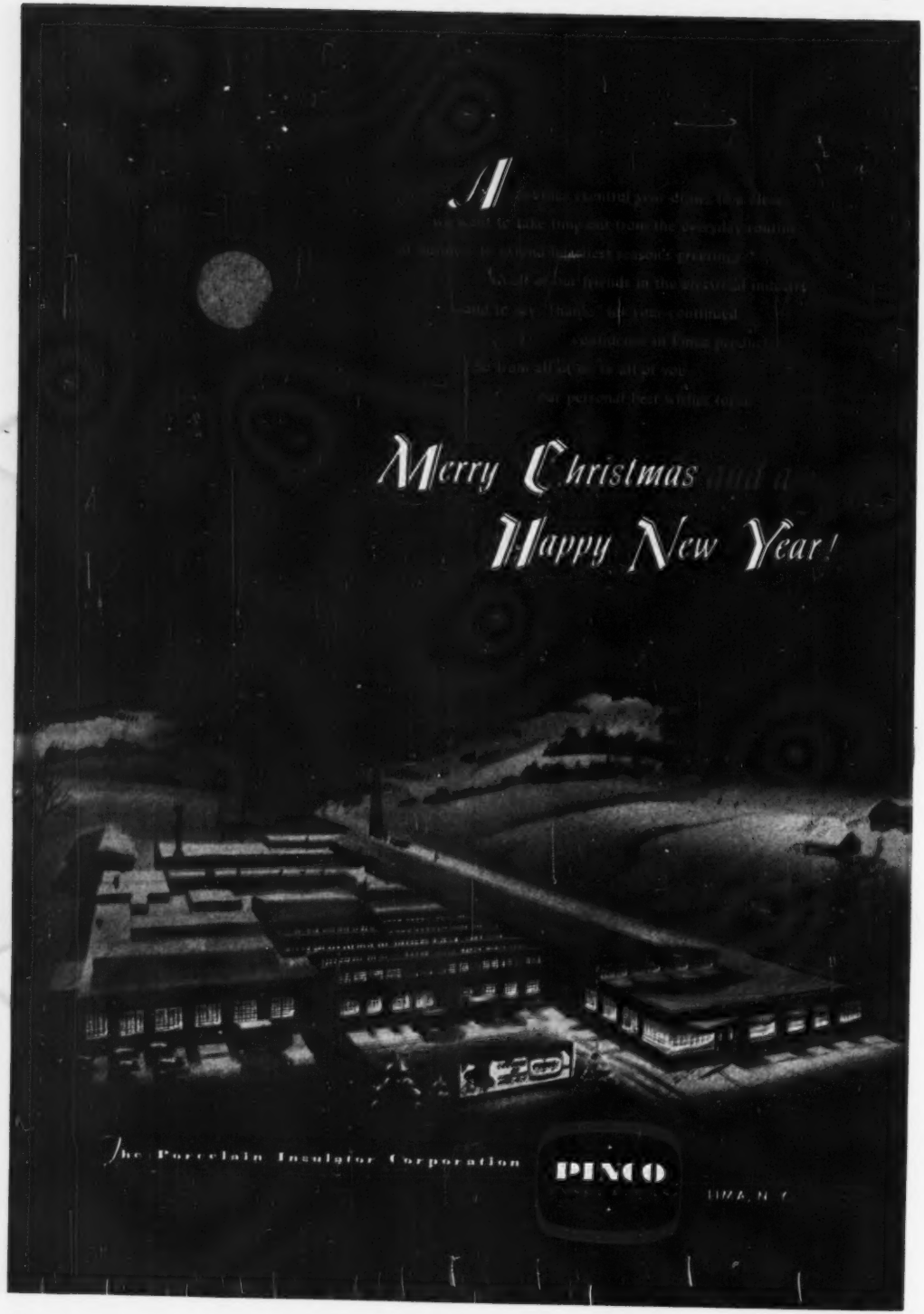
"Our teamwork is better because the FWD engineered combination of truck and equipment is tailored for our particular kind of construction work."

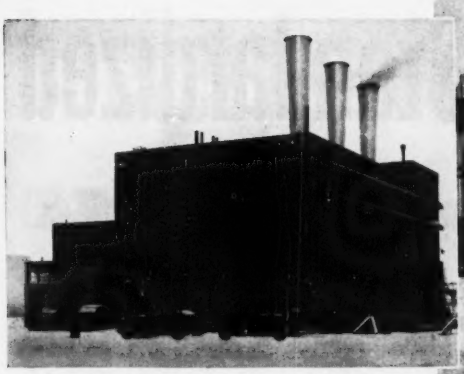
Yes, you actually *do more work* with FWDs! You carry men, materials and equipment *directly onto location* regardless of terrain. This means more work done *with FWD power* rather than by scarce manpower. In addition, truck maintenance costs go down because FWD design means less stress. And FWDs have up to twice the life! Get full data on over 70 different completely-equipped FWD matched units. They are *utility-engineered* to serve the full work-range of line construction and maintenance.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wisconsin • Canadian Factory: Kitchener, Ont.

World-wide sales and service

America's Foremost Heavy-Duty Truck


A
Merry Christmas and a
Happy New Year!
The Porcelain Insulator Corporation
PINCO



Power house of Ford Motor Company's Buffalo Stamping Plant, Lackawanna, N. Y., equipped with Exide-Manchex Batteries for switchgear operation and emergency lighting.

Bank of 120-cell DME-9A Exide-Manchex Batteries mounted on Exide 3-step #37333 rack.

Exide-Manchex

PROVIDES BATTERY POWER AT FORD'S BUFFALO STAMPING PLANT

Efficiency of operation and equipment is characteristic of all departments of the great Ford Motor Company organization. Thus it is significant that the battery selected for the power house of their Buffalo Stamping Plant is an Exide-Manchex. This is the third Exide-Manchex at this plant, each a 120-cell DME-9A battery.

Throughout the country, in public and private power plants of all sizes, the Exide-Manchex is daily proving its dependability, long life, and economy. In Exide-Manchex Batteries you get:

POSITIVE OPERATION: Dependable performance at ample voltage with no switching failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for dependable performance of all other control circuits and also emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution needed during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding of equipment.

These are the features that help to make Exide-Manchex *your best battery buy* for all control and substation services.

• • •

LEAD CALCIUM BATTERIES

Exide first produced Lead Calcium Batteries in 1935. Since that time we have progressively followed an extensive program of laboratory research and development along with a study of Exide Lead Calcium Batteries in actual service.

Much has been learned during those 16 years. Though the time is too short to specifically predict length of battery life, definite conclusions have been reached regarding proper application. We will be glad to inform you where these cells can satisfactorily serve.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" *Reg. Trade-marks U.S. Pat. Off.*

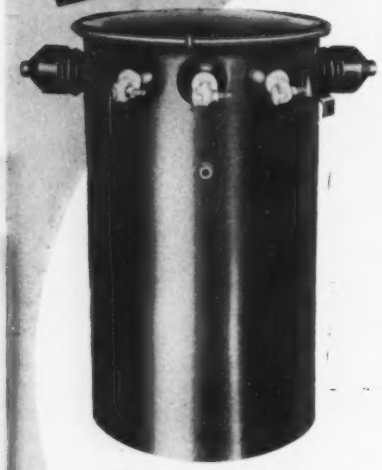
1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

Wagner
TRANSFORMERS
. . . the choice of leaders in industry

Standardized - Wagner

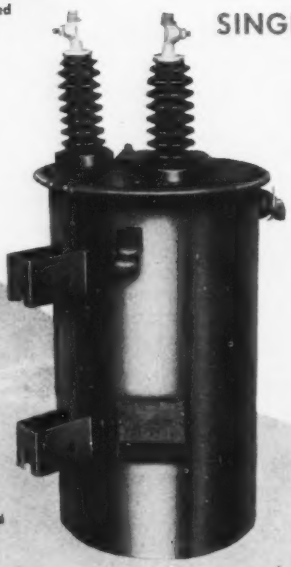
and here's what it means to you:

When you make your selection from Wagner's widely diversified line of distribution transformers—you get the benefit of improved design . . . better performance . . . longer life . . . *plus* standardized mechanical features that mean easier installation and greater convenience in handling and maintenance. These distribution transformers are standardized in full accordance with E. E. I.-NEMA recommendations and are available in all standard kva ratings and voltage ratings.



Type HEB—Sidewall mounted high voltage bushings. 10 kva unit shown.

SINGLE-PHASE



Type HEK—Cover mounted high voltage bushings. 15 kva unit shown.

Type HEX—Pocket mounted high voltage bushings. 50 kva unit shown.

- in every rating and design

DISTRIBUTION TRANSFORMERS

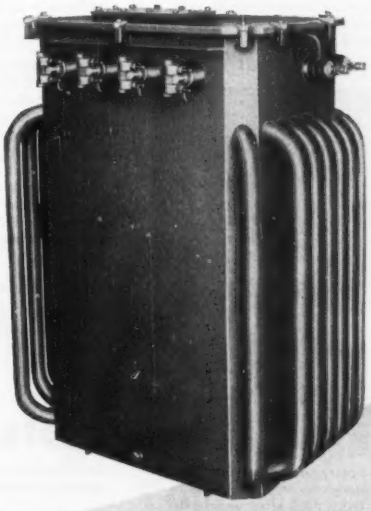
All Wagner pole-type, single phase transformers with round tanks in ratings 50 kva and below are now furnished with the Wagner Form W element, with preformed cores of cold rolled, oriented grain steel and with the exclusive SHUR-SEAL Cover that provides true sealed tank construction. The SHUR-SEAL Cover prevents "breathing" and insures against leakage of oil during shipment or handling.

* * *

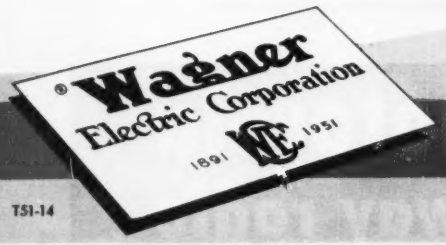
Wagner has a nation-wide organization to provide fast, convenient service, with branches in 31 principal cities. Bulletins TU-180 and TU-181 give complete information on Wagner Transformers.

Vertical type with sidewall mounted high voltage bushings.

THREE-PHASE



Type HPB—Sidewall mounted high voltage bushings. 112.5 kva unit shown. High voltage bushings are cover mounted on types HPK and HPL.



WAGNER ELECTRIC CORPORATION

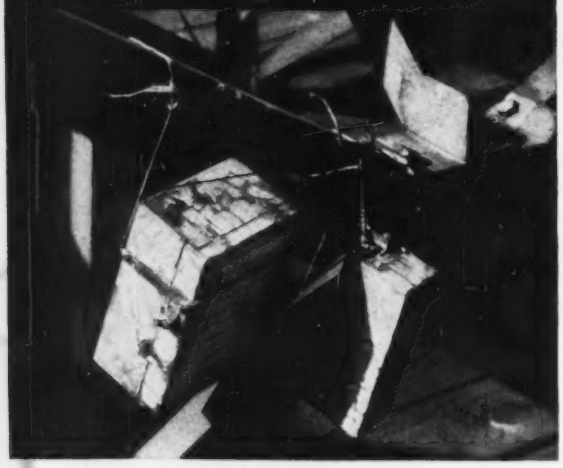
6456 PLYMOUTH AVE. • ST. LOUIS 14, MO., U. S. A.

ELECTRIC MOTORS · TRANSFORMERS · INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS · AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

T51-14

Motorola 2-way radio



Weather Exposure

After eleven months of exposure, through one of the toughest winters on record, the two Permakay units (photographed on the roof of Motorola plant) showed no significant change in selectivity characteristic.

Thermometer reads —30° centigrade as the Permakay selectivity reading remains same as before this extreme cold test was started

In laboratory torture tests Permakay goes through blistering +90° centigrade test without effect on selectivity readings.

Motorola first with Sealed-Unit Selectivity

In the exclusive *Sensicon* design of the Motorola *Permakay* wave filter, 15 nuisance tuning adjustments are removed and permanent selectivity is guaranteed for the life of the set!

More tuned circuits and superior performance with *fewer* tuning adjustments in the SENSICON Receiver are achieved by using the PERMAKAY IF Wave Filter. The modified constant-K, m-derived band pass filter contains 15 tuned circuits . . . BUT . . . you are not burdened with field alignment and complex tuning adjustments. The filter, tuned and sealed during manufacture, requires no further adjustments . . . *ever*. This combination provides over 100 db signal rejection at the *edge* of the adjacent channel while providing a broad band-pass at 6 db for full modulation deviation acceptance.

Motorola's unique Permakay system of linear phase shift adjustment solves the problem of reflection and pulse noise control to provide maximum signal-to-noise ratio for the phenomenally high interference-rejection.

The PERMAKAY Filter characteristics are made permanent by casting the entire unit in a solid block of polyester-styrene plastic. Never can the precisely tuned circuitry be affected by water, dirt, heat, cold or mechanical shock. Temperature compensation insures constant performance even at extreme temperatures as demonstrated in all rigid laboratory torture tests. Motorola's *unconditional* guarantee of the PERMAKAY Filter for the life of the set again demonstrates that Motorola is still your best investment.

Over 22 Years of Leadership in Mobile Radio . . .

Year in and year out, Motorola installations number more than *twice* those of all other manufacturers *combined* and more than *five times* those of the nearest competitor.

Motorola

Communication and Electronics Division
4545 Augusta Blvd., Chicago 51, Illinois

DUST AND HEAT-PROOF

WATER AND COLD-PROOF

TAMPER AND SHOCK-PROOF

Motorola 2-way radio

KEARNEY Pioneers Again!

Introducing the

SQUEEZON

the NEW Pure Copper Cold Welder Connector That Eliminates Contact Corrosion

by permanently sealing out air between conductor, connector and tap transfer surfaces with tons of pressure

JAMES R. KEARNEY CORPORATION
ST. LOUIS, MO.

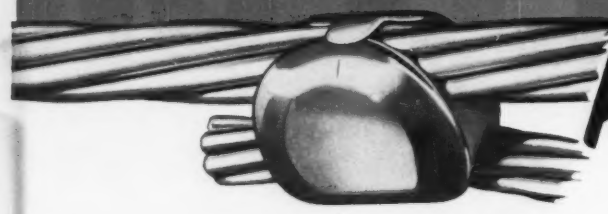
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

...turn the page for more information on the Kearney Squeezon

THE KEARNEY SQUEEZON
a Forward Step in Power Line Connection

The KEARNEY SQUEEZON

Is a Completely New, Advanced Type CONNECTOR That Gives You a Quicker, Better, More Permanent Connection



At ½ the Cost!

Why This New Kearney Connector Was Developed

It is an accepted fact that the major causes of connection failure are (1) overheating caused by the increased resistance of contact surface oxidation, and (2) loosening caused by line vibration and change in temperature.

Kearney set out to overcome these problems by developing a compression connector designed for today's increased loads. The Squeezon is the result!

Prevents Oxidation of the Contacting Surfaces

Each conductor slips into a rounded trough or bed in the connector which conforms to the shape of the wire. After tremendous hydraulic pressure is applied, the Squeezon is pressed around the wires so tightly that all air is permanently excluded from between transfer surfaces.

Because corrosion of these critical surfaces cannot occur and because of the pure copper composition of the Squeezon, conductivity is extremely high. Result: the temperature of the connection is kept well below the temperature of the line wire.

Now, for the first time, it is possible to construct an electrical pipe line from generator to user completely fabricated of pure, permanently connected copper.

Every Connection Is Uniformly Tight

Linemen have widely varying ideas of what constitutes a tight connection. The Kearney Squeezon removes the guesswork from line connection — each one is compressed exactly the same amount — the correct amount for perfect contact and prevention of damage to conductors. There are no "bad" connections to fail.

Costs Less to Use — Costs Less to Buy

Connections are extremely easy to make. The tool is light, simple to use and enables the lineman to work quickly. You can buy a hydraulic tool for each service truck out of the first year's savings when you use the SQUEEZON!

Specify KEARNEY PRODUCTS

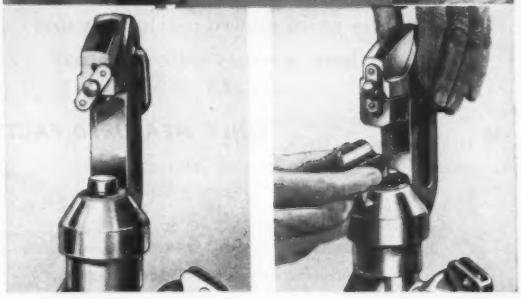
The Quick, Modern SQUEEZON Way...

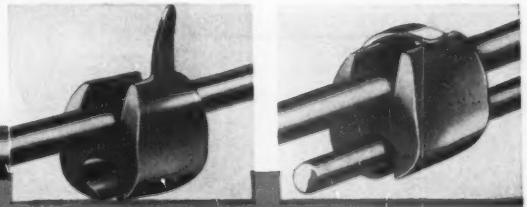
A CLICK—and it's Done!

The KEARNEY SQUEEZON is a pure copper compression-type connector forged in a shape having an "H" cross-section. The connection is made by placing one conductor in the top half of the "H" and the other in the bottom. The sides are then coined over under tremendous hydraulic pressure — applied by pumping one handle of the SQUEEZON Tool. When a distinct click is heard the connection is then complete, permanent and a perfect electrical bond.

Write today for the big, 8-page bulletin on the Squeezon.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario





JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

Better Construction – *SAFER* Maintenance

CONCERNING METERS –

"Penny-Wise...Pound Foolish"?

IN an attempt to save copper and other critical metals in World War II, the production of watthour meters was stopped and thousands of homes were served with flat rate power.

Was metal really saved?

Let's look at the record . . . By the end of the emergency there were some 300,000 unmetered services. The result was uncontrolled, excessive consumption of power and inefficient use of generating, transmission, and distribution equipment—*all heavy users of critical copper.*

The waste entailed was proven by case histories which showed conclusively that when these services were eventually metered, both demand and total energy used dropped 40% or more!

Since concern for the production of heavy electrical equipment could cause the neglect of small tonnage use of metals, as required in the manufacture of watthour meters, consideration should be given the fact that *one pound of copper used in a meter saves as much as fifteen pounds* in generation, transmission, and distribution.

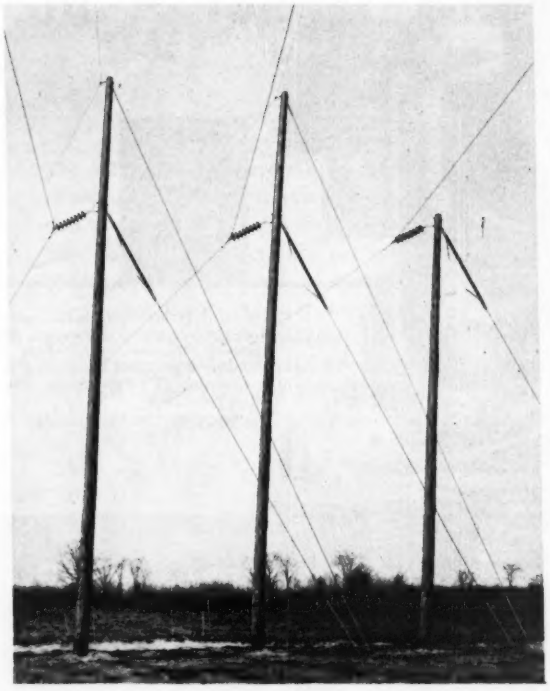
Let's not waste copper again . . . In the interest of real conservation the watthour meter manufacturers need the electric utility's help in securing adequate materials under CMP, so there can be no unmetered electric services.

ONLY MEASURED FACTS ARE KNOWN FACTS

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JOSLYN APITONG
STRAIN INSULATORS



Penta treated at 6 pounds pressure.

STRONG---

MECHANICALLY—

Every strain insulator is factory tested after assembly of hardware to the rated working load. Actual ultimate strengths are, of course, considerably higher. Two sizes are available; 6000 pound working load (10,000 pounds minimum ultimate), and 12,000 pound working load (26,000 pounds minimum ultimate).

ELECTRICALLY—

Apitong has remarkably low moisture absorption and excellent electrical characteristics; thousands are in use without arcing horns.

APITONG —***A dense tropical wood—possesses unique features which enables Joslyn to offer the highest quality strain insulators.***

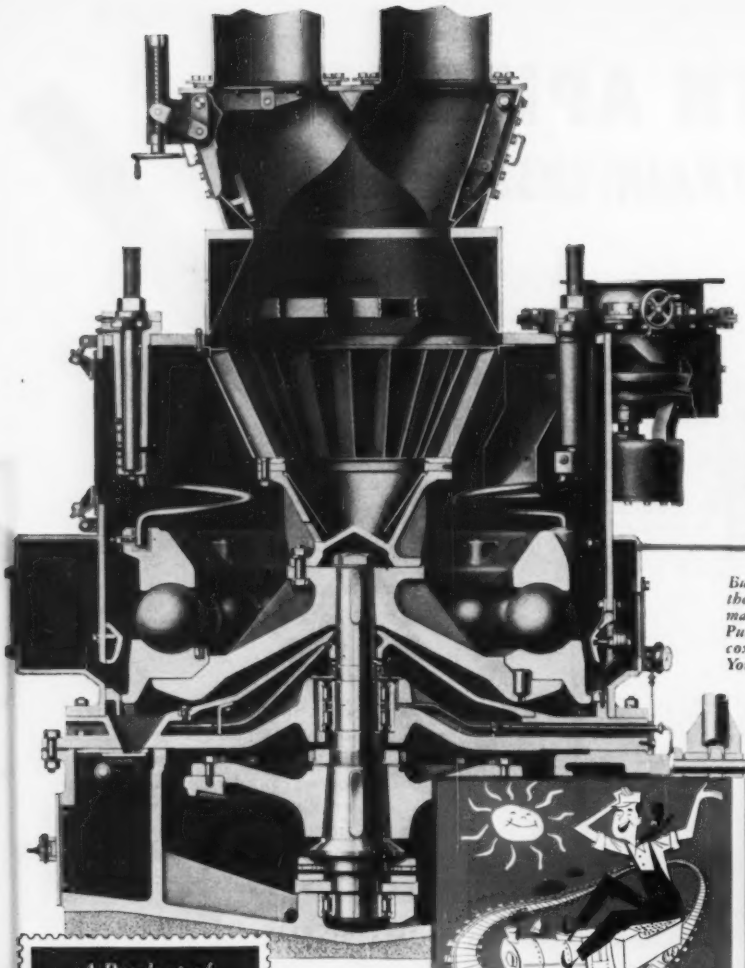
Plants & offices in principal cities

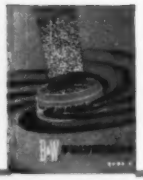
THE JOSLYN CO.
THE SOUTH EAST JOSLYN CO.
SOUTHERN JOSLYN CO.
JOSLYN SOUTHWEST CO.
JOSLYN PACIFIC CO.

JOSLYN MFG. AND SUPPLY CO.

Complete Pole Line Equipment

20 NORTH WACKER DRIVE, CHICAGO 6, ILL.





Bulletin G-57 illustrates and describes the design, construction, operating, and maintenance features of the Type E Pulverizer. Write: The Babcock & Wilcox Company, 85 Liberty Street, New York 6, New York.

A Product of B&W Engineering for Economy

Recirculating Load—Dries as It Grinds

Recirculation of fines within the mill gives repeated, quick-drying contact with large masses of heated air and metal . . . produces proper fineness at all loads, even with coal as wet as it can get. Fines are classified in the mill.

Uniform Performance Regardless Of Wear

Balls and grinding rings wear together . . . assure uniform fineness regardless of attrition of the grinding elements . . . fineness automatically increases at reduced loads.

A big asset in *low-cost* power generation

The only accurate measure of pulverizer efficiency—*and ultimate cost*—is a function of availability, plus combined materials and labor maintenance per ton of product over long periods of continuous operation. B&W recently surveyed a representative group of utilities, covering a wide geographical area and broad range of coals. More than 100 B&W Type E mills were reported in service from one to ten years, and with aggregate product of 25 million tons:

- Average Availability: 96.5%
- Average total maintenance cost per ton: 3.12 cents

It will pay you to remember this outstanding—and typical—history of dependable, low-cost performance when considering your next pulverizer installation.

Blows Clean Air—Saves Wear and Tear

Unique in pressurized operation, the Type E Pulverizer requires remarkably little maintenance of the primary fan, because it blows only clean air . . . is not subject to the damaging abrasion of entrained particles.

One-Point Variable Fuel—Air Control

Like the accelerator on your automobile . . . assures proper coal-to-air mixture . . . produces desired rate of steam generation over a wide range with coal conditions suitable for sustained high combustion efficiency.

Low Power Consumption

Ball-and-ring grinding, antifriction bearings, pressure lubrication, and automatic rejection of ungrindable materials make possible high output with minimum power demand.

Outstanding Performance Record

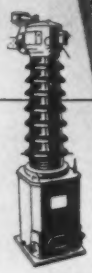
Availability and maintenance economy beyond today's most exacting requirements are proved in over 1300 Type E Pulverizer installations.

Helping Industry Cut Steam Costs Since 1867

BABCOCK & WILCOX

G-5197

The most complete line of Instrument Transformers in the industry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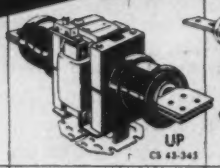
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CT
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CS 45-340

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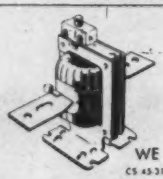
CS 45-305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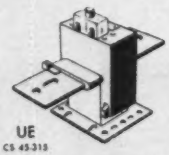
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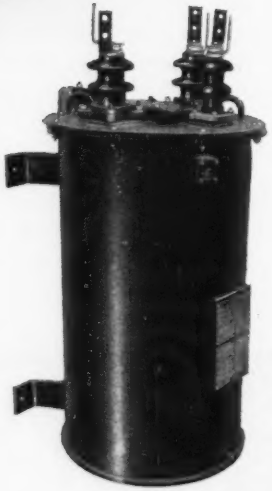
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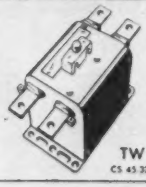
3-phase, 3-wire
CS 45-720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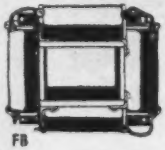
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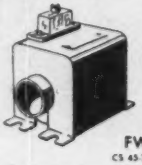
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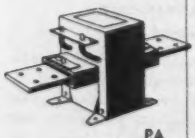
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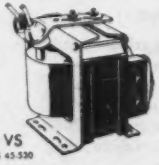
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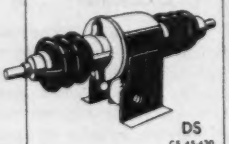
OC-133
CS 45-310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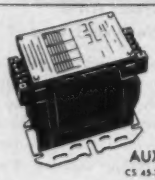
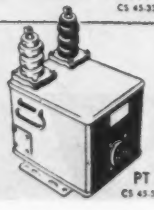
CS 45-430


AUX.
CS 45-306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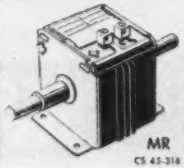
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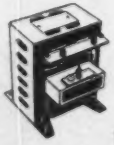
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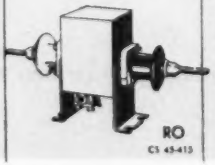
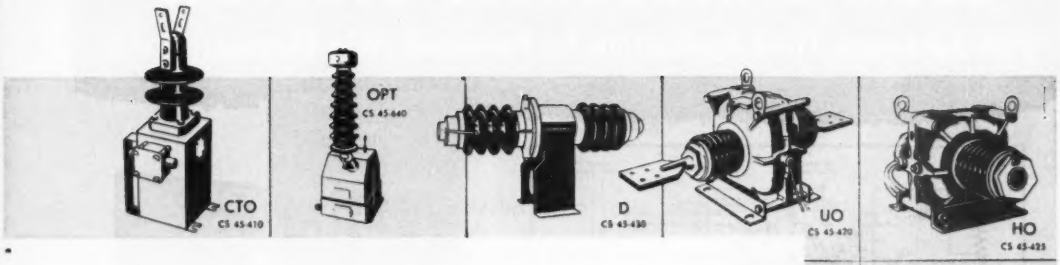
CS 45-330


RO
CS 45-415

OTW
CS 45-407



Versatile . . . for metering, relaying, control!

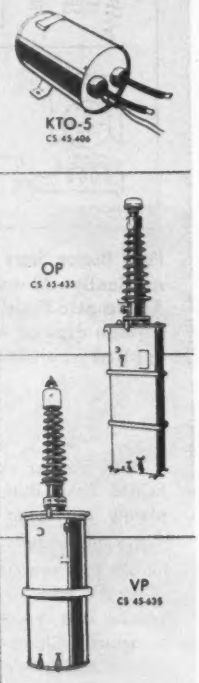
The Type MP combines current and potential transformers in one unit for single or three-phase systems, from 2.5 to 161 kv. Westinghouse Outdoor Metering Outfits, Type MP, are designed for highest accuracy metering, relaying and control device applications.

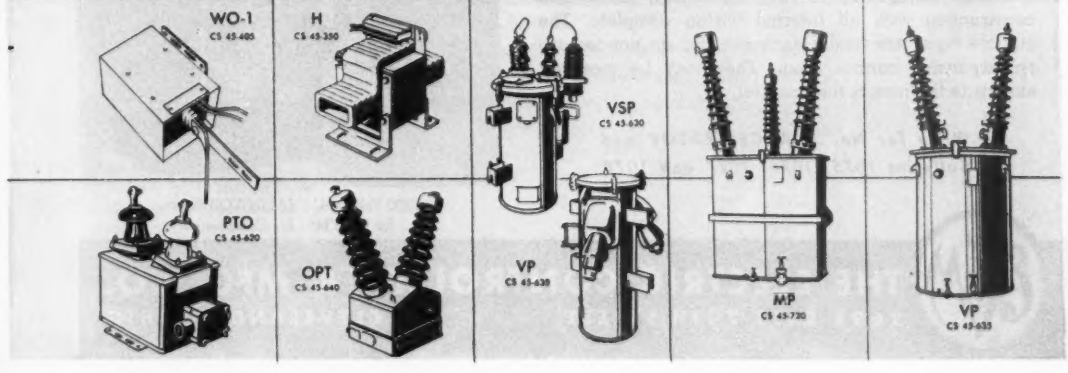
Because he handles the most complete line in the industry, your Westinghouse salesman has specific answers to all your instrument transformer problems. For further information on any of these transformers, ask him for a copy of the catalog section identified by the "CS" number under each transformer illustrated. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70605

YOU CAN BE SURE... IF IT'S

Westinghouse

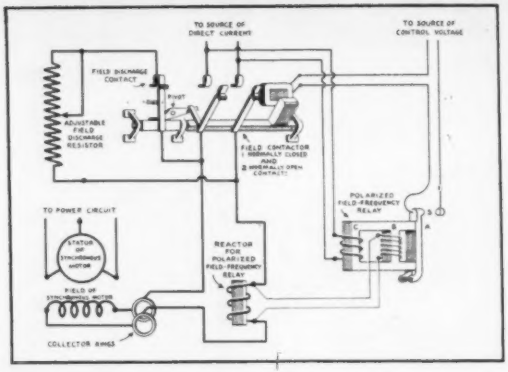
INSTRUMENT TRANSFORMERS





EC&M SYNCHRONOUS STARTERS

with Automatic Field Application by Polarized Field-Frequency Relay



Push Button Start **brings motor up to speed automatically. Motor pulls into step *without delay*. Automatic Field Removal if motor slows down on voltage dips or overload. Field automatically re-applied when load re-accelerates.**

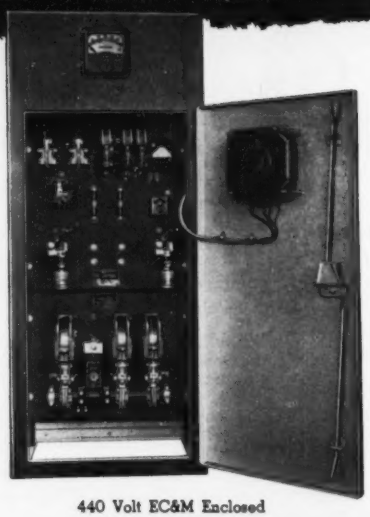
★★★

With greater skill than human hands could do it, EC&M Push Button Magnetic Starters provide completely automatic operation of synchronous motors.

At about 95% synchronous speed, the motor is pulled into synchronism. Full Field excitation occurs when the rotor and stator poles are most favorable to locking into synchronism. This causes synchronization to occur without pole slippage, with minimum line current and greatest synchronizing torque.

EC&M Synchronous Starters are built for both low and high voltages up to 4600 volts. They are of unit construction with all internal wiring complete. The cubicle types are totally enclosed and do not require an expensive control room. They may be mounted alongside the motors they control.

Write for No. 21 ACCELERATOR and Bulletins 1075, 1076, 1077 and 1078



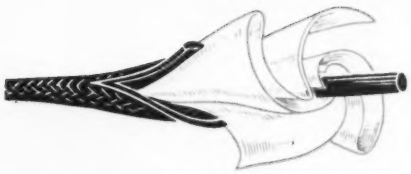
440 Volt EC&M Enclosed Synchronous Starter

2300 Volt EC&M VALIMITOR Starter for Steel Mill Air Compressor

THE ELECTRIC CONTROLLER & MFG. CO.

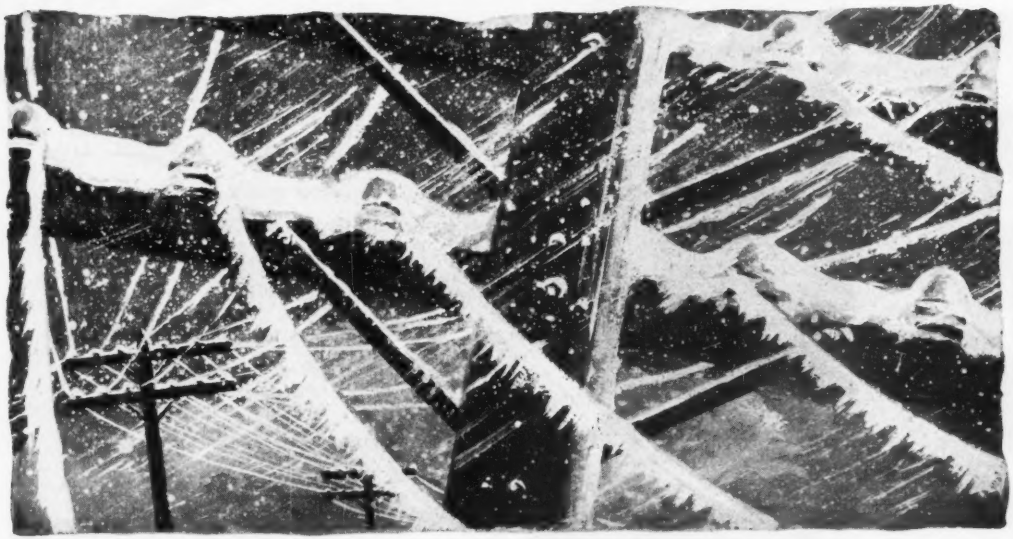
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

install Duraline...



DURALINE* gives longer, better service because of its unique construction — a continuous, interlocked fibrous sheath, thoroughly impregnated with genuine URC saturants, then covered with URC finishers.

and forget about **this** ↓



DURALINE provides finest weatherproof performance . . . keeps moisture out . . . won't festoon . . . gives added protection against damage by foreign objects. 51345

Your nearest Anaconda Sales Office has full details on Duraline with copper, Copperweld or aluminum conductor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

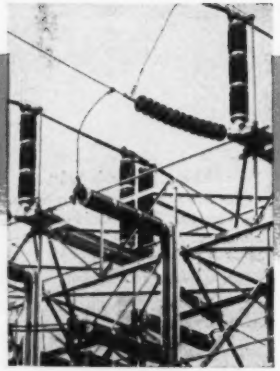
*Reg. U. S. Pat. Off.

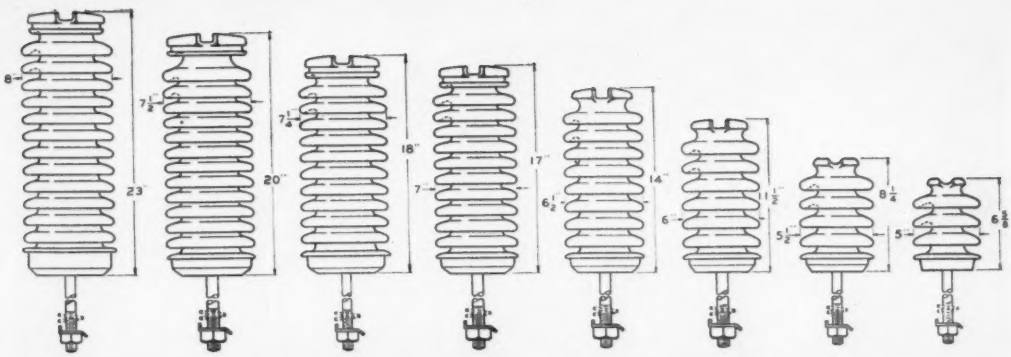
the right cable for the job

ANACONDA® WIRE AND CABLE

THE "NEW" INSULATOR DESIGN WITH

The Lapp Station Post, incorporating the same design and performance characteristics as the Lapp Line Post, boasts an operating record unmatched by any other insulator for switch and bus support use.





9982	9366	13560	9355	9345	9335	9325	9320
9978	9466	13561	9455	9445	9435	9425	9420

THE 20-YEAR SERVICE RECORD

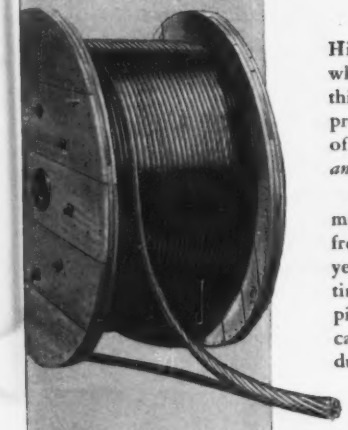
How much of the equipment on your system was designed 40 years or more ago? If you can think of any, would you rate it at "top efficiency" by 1951 standards? The design of most of your insulators is that old. There's been only one significant innovation in insulator design since before 1910. That innovation was the Lapp Line Post, and subsequent Station Post design. So this is the "new" design, the "different" insulator. And, we hasten to add, by the degree it's *different*, it's a better insulator. Twenty years ago we were promising . . . no radio interference . . . no puncture . . . no cracking . . . no cleaning . . . greater resistance to stones and bullets . . . better performance under arcover. And today, with a 20-year service record to back us up, we can add those things all up in saying "*Lines on Lapp Line Posts have fewer outages, require fewer insulator replacements and less maintenance than comparable lines on any other type of insulator.*"

Isn't it time *your* standards got to a 1951 basis? Specify Lapp Line Posts.

Lapp

LAPP INSULATOR CO., INC., LE ROY, N.Y.

(Photo courtesy Knoxville Power Co.)



33 Years at hard labor . . .

High in the Smoky Mountains whipped by wind, rain, and sleet, this 5,010-foot Alcoa ACSR span proves the combined advantages of ACSR—*strength, light weight and economy.*

Installed in 1918, this almost mile-long span has given trouble-free service and is good for many years more . . . long-standing testimony to the success of Alcoa's pioneer ACSR work in sag tension calculations, vibration and conductor fatigue problems.

"What's in it for you" can be found in the records of Alcoa's aluminum experience built up over 63 years. This vast amount of shirt-sleeve, working knowledge about the design, manufacture and installation of conductors can help you solve your transmission line problems.

Although the rearmament program prevents unrestricted use of aluminum, we are ready to help you with the planning required for power transmission projects.

TECHNICAL HELP—NO OBLIGATION

Write for help, advice or technical literature. Address: ALUMINUM COMPANY OF AMERICA, 2100M Gulf Bldg., Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN ALUMINUM FIRST IN **A·C·S·R**

Aluminum Cable Steel Reinforced

LOCKE

presents masterpieces of

insulator engineering

Perfection

...in low voltage suspensions typified by

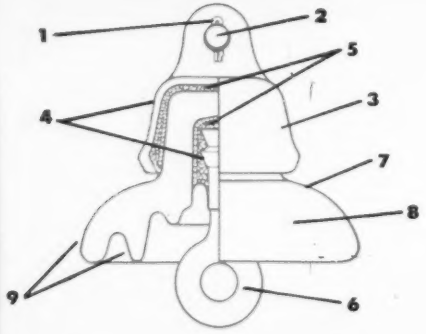
LOCKE'S

No. 16583

Take this step toward further reducing your cost per kilowatt hour. Test Locke's Low Voltage Suspensions on a dollars-and-cents basis. You'll find that excellence of design and manufacture enable them to generally out-perform all others. This, of course, is the reason why utilities have specified them by the tens of millions since their original development in 1904.

Presenting **A MASTERPIECE OF INSULATOR ENGINEERING**

The LOCKE *low voltage* Suspension Insulator



You get ALL these advantages in this LOCKE DESIGN

1. Humped cotter key saves time and labor because linemen can install and remove cotter bolt faster, easier.

2. High strength cotter bolt assures service continuity.

3. Top quality forged steel or malleable iron caps, and forged eyes . . . add years of dependable service to the insulator.

4. Corrosive action on metal parts due to action of cement is eliminated because these surfaces are coated with a special non-hardening, resilient coating. This coating not only acts as an expansion joint which eliminates breakage due to temperature changes, but it also helps distribute loads efficiently.

5. Locke Compression Sand, applied at both cement joints, gives added strength and stability to the insulator.

6. Hot line work is greatly simplified because ample clearance is provided between the eye and the porcelain . . . and because of the humped cotter key at the top of the insulator.

7. The possibility of breakage, caused by thermal shock and mechanical impact, is greatly lessened because porcelain surface is covered with Locke Compression Glaze.

8. Because Locke Wet-Process porcelain is used throughout, the insulator is fully capable of withstanding power arcs, lightning flashovers and extremely rough handling.

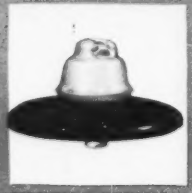
9. You get highly satisfactory performance during electrical storms and rains because of adequate flashover ratings . . . and maximum leakage distance.

YOU ARE EQUALLY SURE of getting a masterpiece of design when you specify other products in the complete line of Locke Insulators and suspension hardware. Each pays off in superior performance on transmission and distribution lines, generating stations, sub-station and electrical apparatus. Locke Department, General Electric Company, Baltimore, Maryland.

LOCKE

LOW VOLTAGE PIN TYPE INSULATORS

HIGH VOLTAGE PIN TYPE INSULATORS



SUSPENSION INSULATORS

SWITCH & BUS INSULATORS

SPOOL INSULATORS

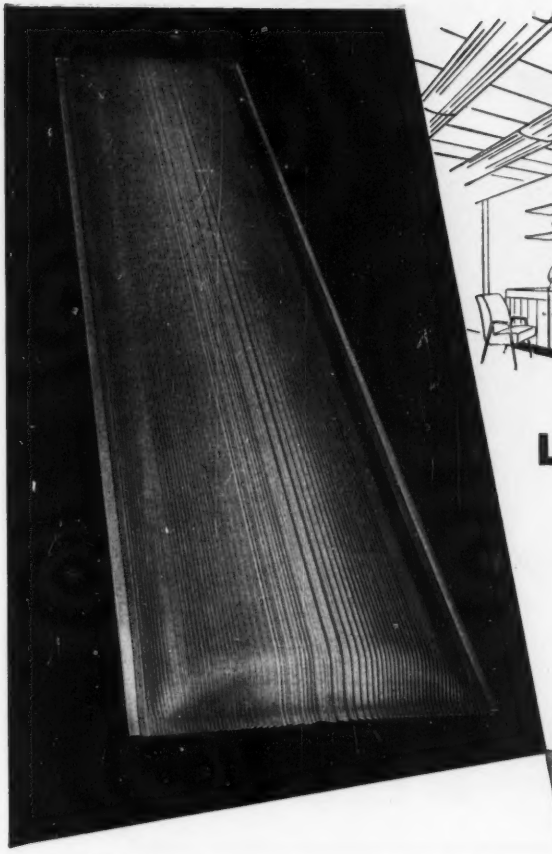
GUY INSULATORS

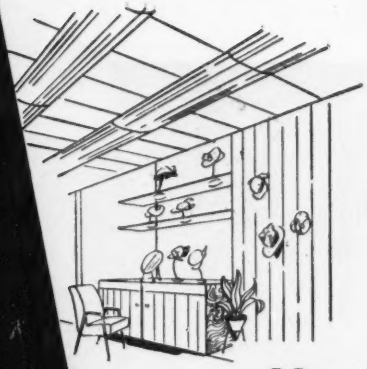
LIQUID-FILLED BUSHINGS

SUSPENSION & STRAIN CLAMPS

SUSPENSION HARDWARE

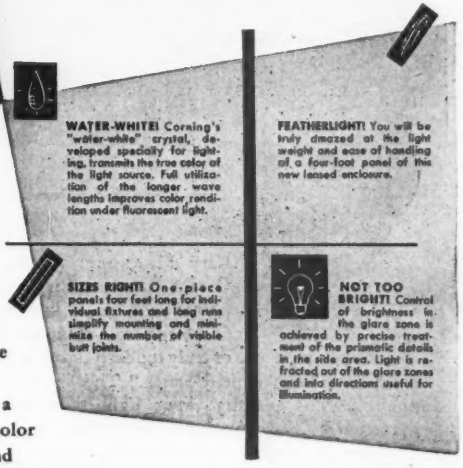
ENTRANCE BUSHINGS





New Corning Lightweight Curved Lens Panel

Fixture-length for More Pleasing Appearance


WATER-WHITE! Corning's "water-white" crystal, developed specially for lighting, transmits the true color of the light source. Full utilization of the longer wave lengths improves color rendition under fluorescent light.
FEATHERLIGHT! You will be truly amazed at the light weight and ease of handling of a four-foot panel of this new lensed enclosure.
SIZES RIGHT! One-piece panels four feet long for individual fixtures and long runs simplify mounting and minimize the number of visible butt joints.
NOT TOO BRIGHT! Control of brightness in the glare zone is achieved by precise treatment of the prismatic details in the side area. Light is refracted out of the glare zones and into directions useful for illumination.

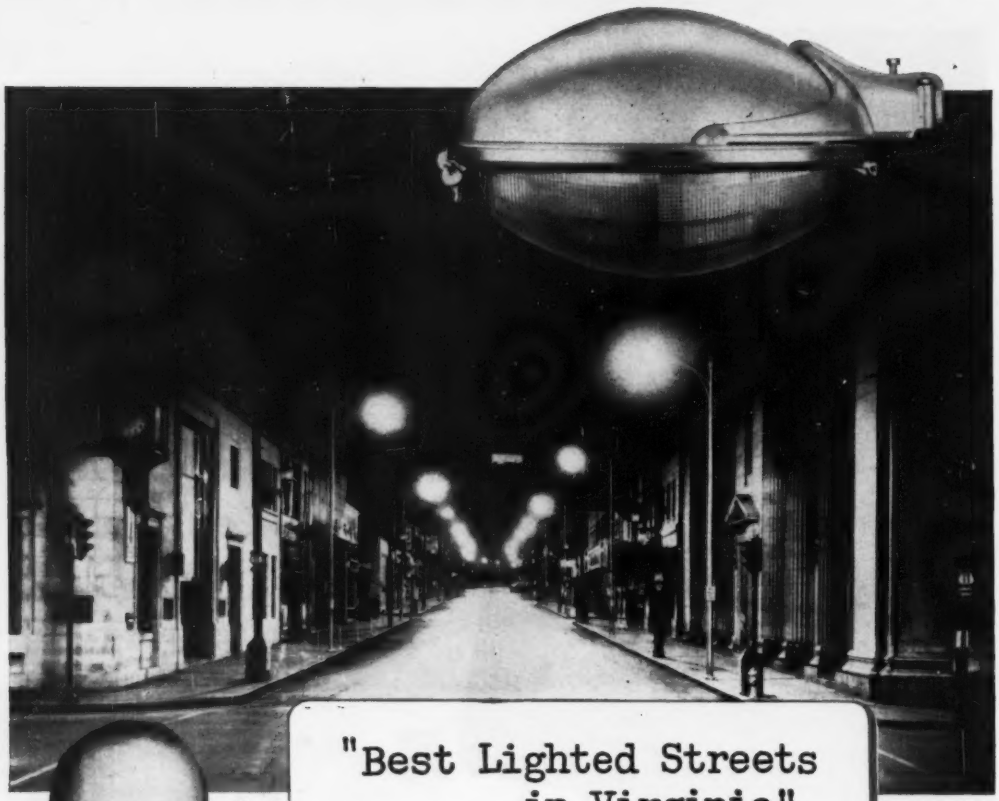
Entirely new in the field of lensed enclosures is the new lightweight *single piece* Curved Lens Panel developed by Corning to complement the clean-lined styling of modern fluorescent fixtures. The pleasing appearance of its fixture-length panels of crystal-clear glass reflects the increasing importance of lighting glassware as an architectural element. The precise optical design in "water-white" crystal is a realization of the need for scientific control over the color and quality of the light produced. Open and closed end panels are available in four standard sizes, and consideration will be given to special lengths and widths. The coupon will give you complete information. Mail it today!

CORNING GLASS WORKS
CORNING, NEW YORK
Corning means research in Glass

1851 • 100 YEARS OF MAKING GLASS BETTER AND MORE USEFUL • 1951
Technical Products Division: Laboratory Glassware, Signalware, Glass Pipe, Gauge Glasses, Lightingware, Optical Glass, Glass Components

CORNING GLASS WORKS, Dept. EW-12, Corning, N. Y.
Please send me complete information on new Lightweight Curved Lens Panels.

Name_____
Firm_____
Address_____
City_____ Zone____ State_____



"Best Lighted Streets in Virginia"

City Manager, Arthur Owens, Roanoke, Virginia, points with pride "to the first large-scale application of truly modern lighting in the Southeastern United States." The Westinghouse OV-20 mercury vapor lighting system, installed by the Appalachian Electric Power Company, is making a hit with the citizens:

"We have already ordered a sizable extension to relight our secondary business streets, and we believe that universally favorable response to this lighting system will eventually lead to installation of hundreds of similar units on our arterial approaches, bridges and viaducts."

Arthur S Owens

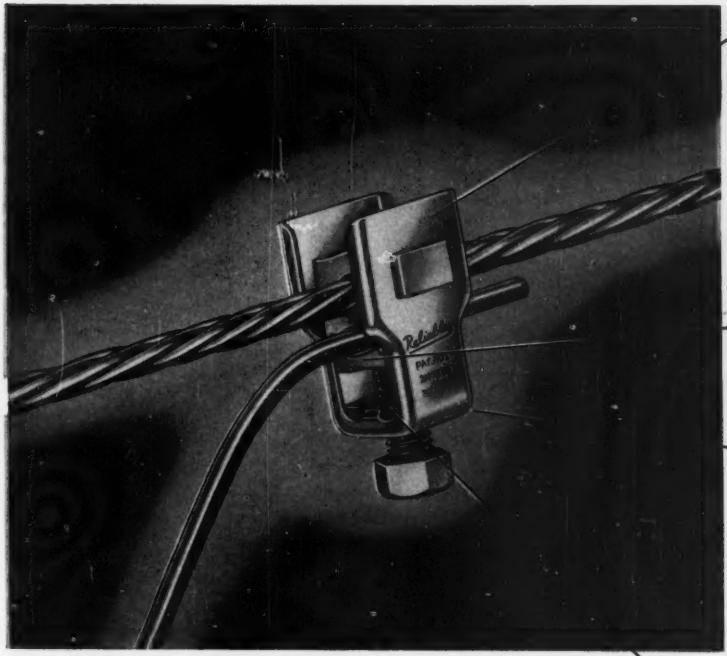
What's more, they have invested in a system that is easy to maintain. Hinged construction of the OV-20 makes routine cleaning a matter of minutes. Relamping can be done with one hand.

Whether you buy lighting, install lighting or plan lighting, it will be worth your while to investigate the Westinghouse mercury vapor lighting story. Send for B-3876A, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

J-04302

YOU CAN BE SURE... IF IT'S
Westinghouse
PLANNED
LIGHTING SYSTEMS

Accents on Accuracy



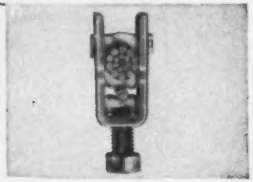
in the manufacture of

FLIP-ON TAP CLAMPS

Rugged, Reliable connections are assured with these precision Flip-On Tap Clamps. Accurately gauged threads and spacers always work smoothly—snug-up tighter, and then stay tight—while large bearing surfaces protect the conductors from damage. Carefully designed and carefully made, all parts are accurately heat treated. Their lighter construction of aluminum alloy reduces vibration fatigue. And where dissimilar conductors are used, spacers are provided with both copper and aluminum faces—to prevent electrolytic corrosion. Spacers accurately align conductors under screw pressure so that the joint gets the full benefit of direct (1:1 ratio) pressure. Reliable's accent on accuracy assures quick and easy installations—rugged, Reliable performance.

1. Precision dies and faultless equipment produce rugged body — wall slots are accurately parallel for easy, reliable pressure-clamping.

2. Exact manufacturing techniques assure these carefully engineered spacers give firm, reliable connections — without damaging conductors.



3. Nut is staked in body before tapping. Four full threads are continuous. Aligning fixture insures accuracy of direction. Pressure on conductors is directly under screw in opposite directions (ratio 1:1).

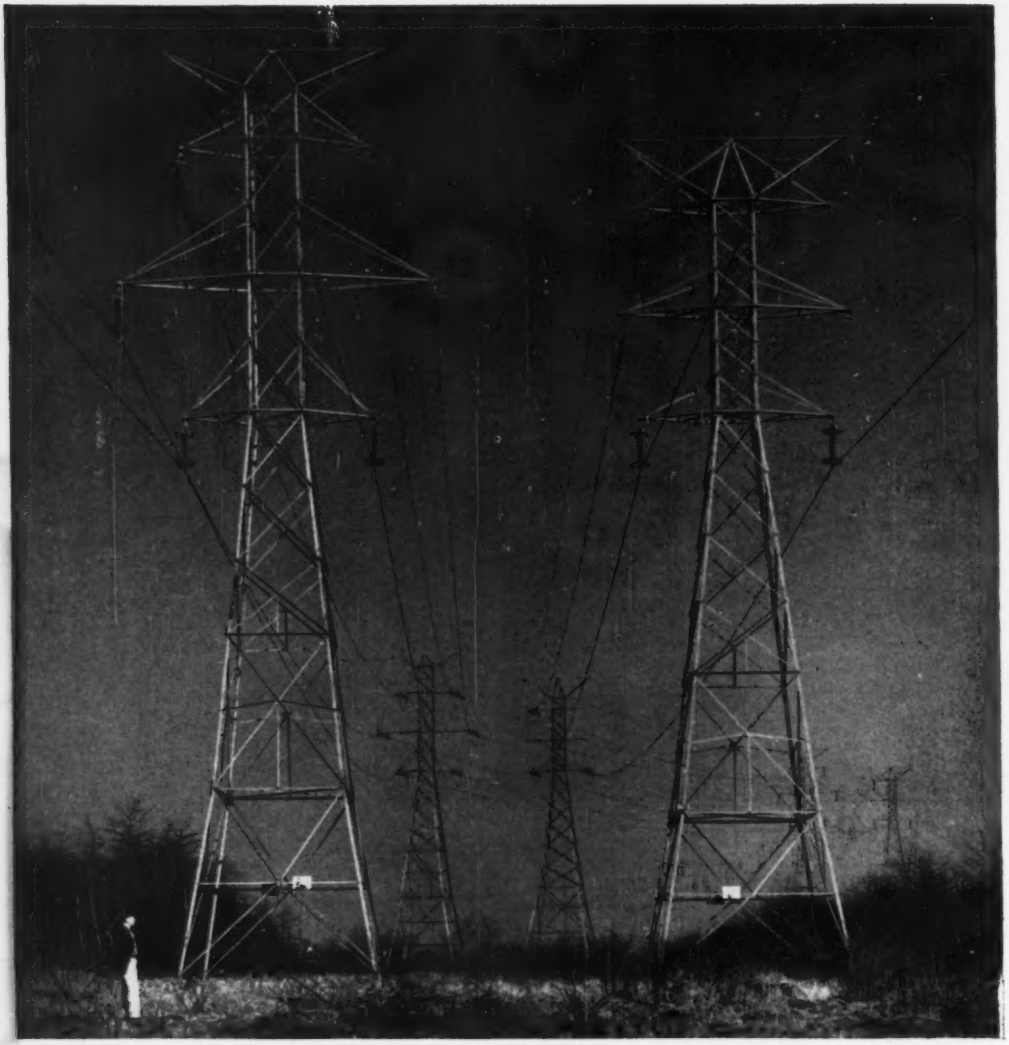
4. Accurately controlled electric furnaces bake long life and reliability into this tough aluminum alloy.

Reliable ELECTRIC COMPANY

3145 CARROLL AVENUE, CHICAGO 12, ILLINOIS

OVER 40 YEARS OF SERVICE TO THE UTILITIES

POWER-LINE CONNECTORS AND CONSTRUCTION SPECIALTIES



Towers near Metuchen, N. J., fabricated by Bethlehem for Public Service Electric and Gas Company of New Jersey. The 124 ft towers at left were erected in 1948; 112 ft towers at right were erected in 1937. Height to lower crossarm of each tower is 75 ft; voltage, 132,000; conductors, 795,000 cm A.C.S.R.; maximum conductor tension, 10,000 lb at a loading of ½ in. ice, 8 lb wind at 0 deg F.

Designed and Fabricated for Economical Performance

When you put your transmission tower requirements up to Bethlehem, you can be sure of getting a first-class job—in design, in fabrication, in long-term economical performance. This is because Bethlehem has had fifty years of experience in designing and fabricating single- and double-circuit towers for service in all parts of the country, and for all possible load conditions.

What's more, our well-located shops have every facility for tower manufacture, including galvanizing.

The nearest Bethlehem office will be pleased to discuss transmission towers with you at your convenience.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

TRANSMISSION TOWERS

PLAY SAFE!

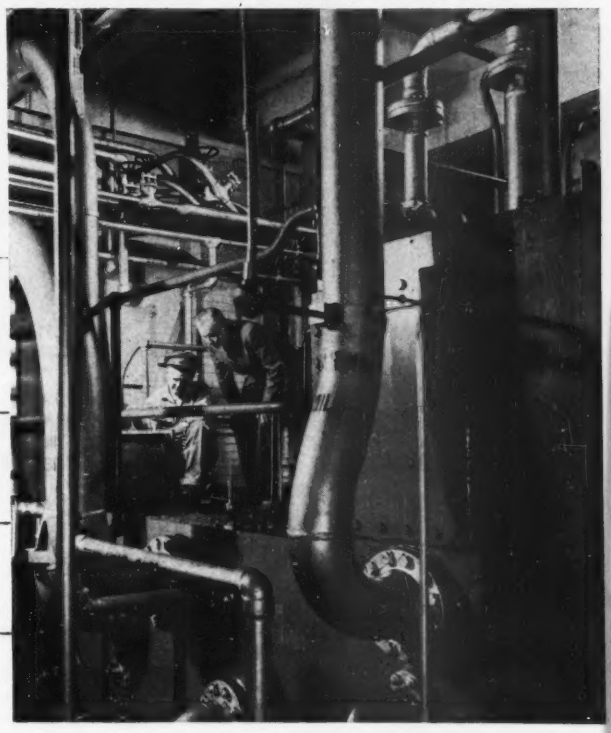
Clean the lubricating system of your new turbine with Gulf Turbine Flushing Oil

Flushes out scale, chips, sand, and other loose foreign matter

Removes harmful slushing compounds

Protects against rust

Economical



It pays to flush new turbine lubricating systems with Gulf Turbine Flushing Oil! Gulf Turbine Flushing Oil has excellent flushing action on welding scale, sand, chips and other loose foreign matter that might have gained access to the system during shipping or assembly. It is also very effective in removing slushing compounds which, if left in the system, may have a harmful effect on the performance characteristics of the turbine oil. And, of course, you make sure that inaccessible parts of the system are clean.

Gulf Turbine Flushing Oil has been fortified to provide an excellent rust preventive film. Thus all oil bathed surfaces in the system get effective protection against rust during the period between flushing and initial operation.

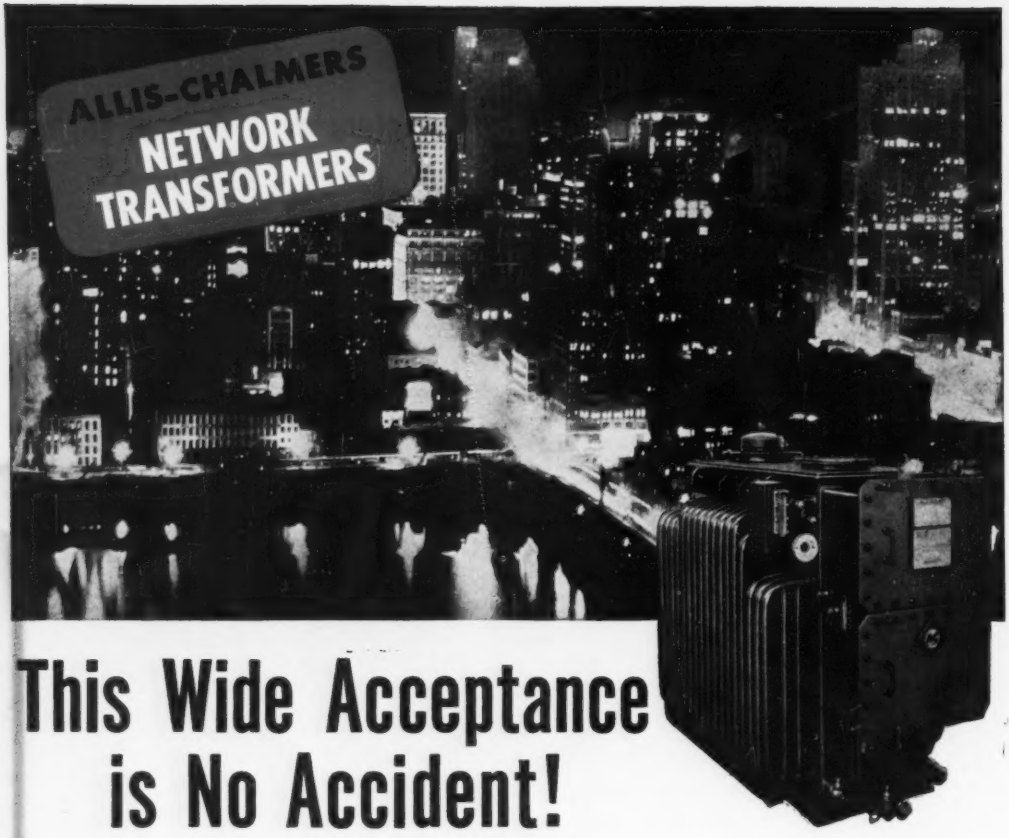
An important advantage of Gulf Turbine Flushing Oil over other types, such as certain solvents, is that the undrained portion in the turbine systems does not impair the lubricating value of the turbine oil. For Gulf Turbine Flushing Oil is itself a satisfactory lubricant.

Only one-third to one-half of a normal turbine oil fill is required for thorough flushing. Thus the expense of flushing your new turbine with low-cost Gulf Turbine Flushing Oil is nominal.

Gulf Turbine Flushing Oil is equally effective for units already in service. In these it helps remove harmful sludge and organic acids—helps flush out deposits which may have collected in the system.

For complete information on this quality product and for recommended procedure for cleaning your turbine, call in a Gulf Lubrication Engineer. Write, wire, or phone today. Gulf Oil Corporation · Gulf Refining Company, Gulf Building, Pittsburgh 30, Pennsylvania.

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS



This Wide Acceptance is No Accident!

NETWORK TRANSFORMERS have to be tougher than most transformers. Not only are they subject to temperature extremes and overloads, but they have to withstand unusually severe operating conditions, flooding and corrosive atmospheres. Because they may have to operate in narrow, below-sidewalk vaults, maintenance is an important factor to consider.

That's why utility engineers are particular about the network transformers they choose for their systems.

One of the best testimonials to dependable all-around performance of Allis-Chalmers network transformers is the increasing approval of utilities and consulting firms throughout the country. Today the A-C label on major electrical systems is a familiar sight. Approximately 1¼ million kva of Allis-Chalmers network transformers are now serving the most important systems in the country.

This vote of confidence is based upon top performance. Details of welding, protective undercoating, convenient location of gages, sturdy core and coil construction and tank design make this outstanding performance possible.

Allis-Chalmers makes all three types of network transformers: oil-filled, *Chlorextol* liquid-filled and the new sealed dry type. Your Allis-Chalmers engineer can make unbiased recommendations on the best type for your particular requirements.

Why not call your local A-C office for more information. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, for Bulletin 61B6152A. A-3515

Chlorextol is an Allis-Chalmers trademark.

LOOK

To Allis-Chalmers Network Transformers For:

- **Compactly designed** circular coil structure. Outside core clamping bolts, sturdy turn-to-turn insulation, built to withstand heavy short-circuit stresses. Thermal capacity is high for cool operation under severe load conditions.
- **Strong construction.** Main cover and switch compartment are welded to the tank to do away with gasket trouble.
- **Easy control** of tap changer operated through a two-inch outlet in the main cover. Eliminates packing gland maintenance.
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A prime rule in using any adjustable wrench is to first adjust it to a snug fit on the nut to be turned. (Fig. 7.) A tightly adjusted wrench is safer since danger of slippage is minimized. A loosely fitted wrench will tend to "round" the corners of hexagonal objects, and may damage the wrench by exerting undue strains on the jaws. Greasy, oil-covered tools are dangerous. Keep handles clean and dry by occasional wiping. Oil should be applied sparingly to moving parts.

Fig. 7

Adjustable Wrenches develop their greatest strength when hand pressure is applied to the side of the wrench carrying the fixed jaw as in Fig. 8. They can, however, be pulled in either direction on moderate loads, and are frequently "flopped" between

Fig. 8

swings to gain an angular advantage and permit continuous rotation of nuts or bolts where cramped quarters limit the handle swing.

"Crestoloy" Wrenches, being thinner (and stronger) than "Crescent" Wrenches, are the preferred tools for use in cramped quarters or when adjustable wrenches are used in pairs as in Fig. 9. For extremely heavy loads, Crestoloys are likewise recommended. (See tools illustrated page 15.)

Fig. 9

4

PLIERS . . . . . and how to use them

Slip Joint Pliers

Crescent Slip Joint Pliers are a general purpose tool having excellent gripping power over a wide capacity range because of their adjustable jaws. Ideal for holding or turning round pieces. Should not be used on nuts or bolt heads. (See tools illustrated page 15.)

Fig. 10

Skinning Insulated Wire

Fig. 12 illustrates the proper way to grasp a light, diagonal plier. The third and little finger "inside" the handles provide pressure to hold the jaws apart. Pressure of the thumb stabilizes the tool and maintains desired jaw opening.

To skin wire, grasp it as shown with the left hand, as in Fig. 11. Now with plier held, as shown, close the jaws sufficiently to cut through the insulation *only*. Don't cut through the conductor!

Fig. 11

Now "rock" plier handles toward left wrist and the prying action will strip the insulation from the wire end.

"Cleaning" or brightening of the bare wire is shown in Fig. 12. Close jaws just enough to provide slight pressure and draw cutter blades along the bare wire a few times. Rotate wire with left hand so that the entire circumference is clean. (See tools illustrated page 17.)

Fig. 12

5

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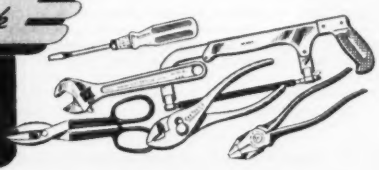

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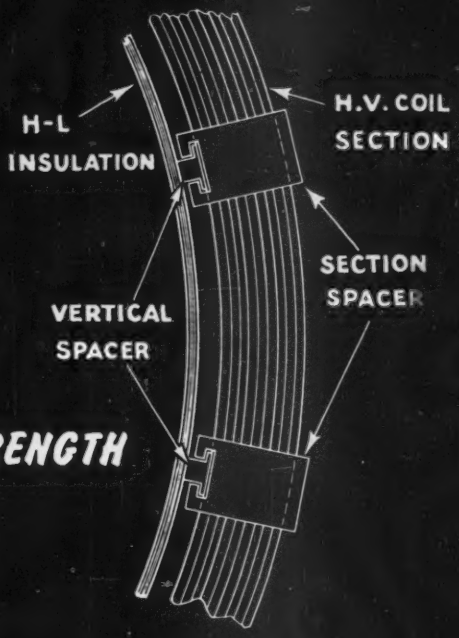

The Kuhlman lock spacer is a permanent connection between the section spacer and the high-low insulation barrier which supplies a firm, solid rigidity to the coil structure. No tape or other material of a temporary nature is used in the Kuhlman connection. Thus, there is no chance of coil sections in Kuhlman Power Transformers working loose from the expansions and contractions of operating temperatures.

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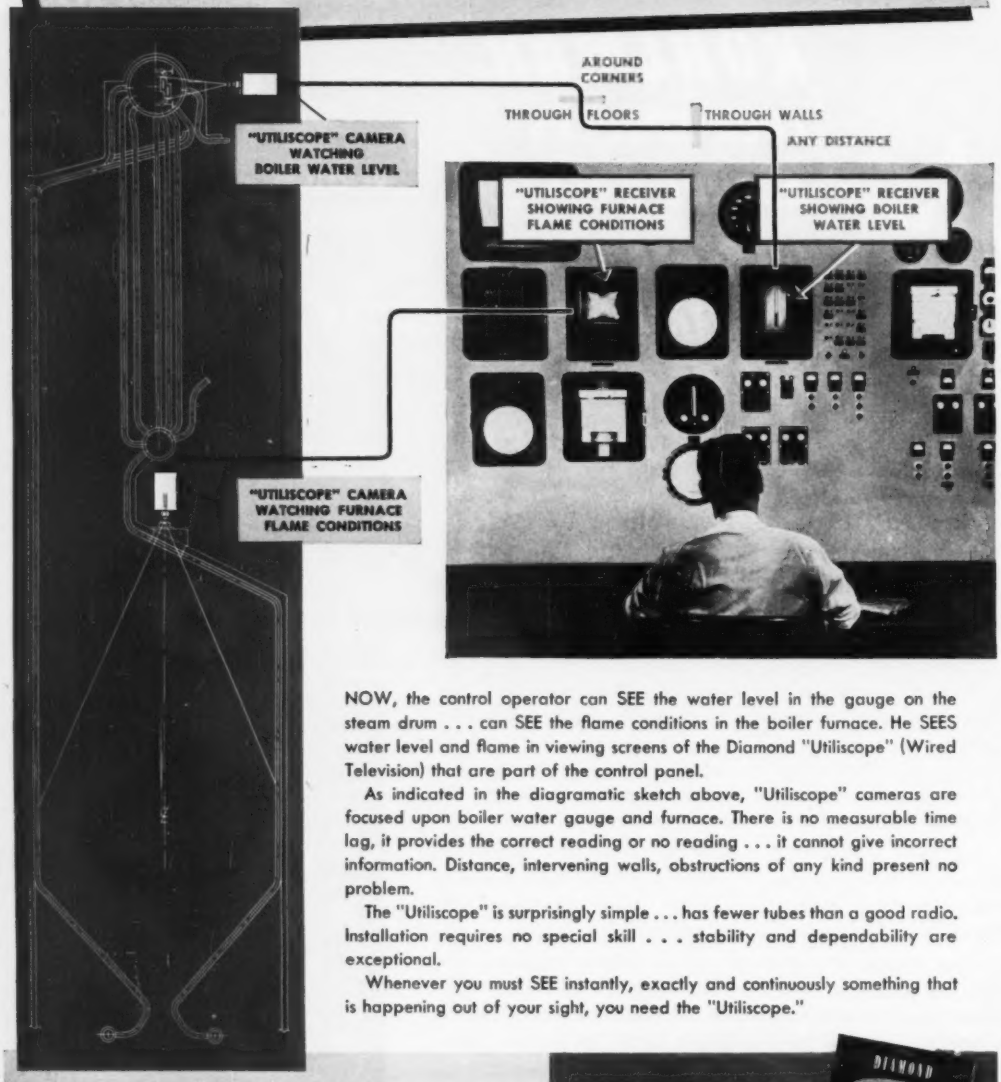
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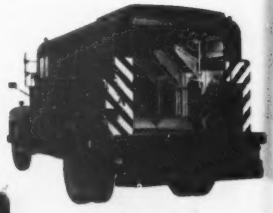

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Grinnell received an order recently for stress relieving prefabricated piping to these specifications:—

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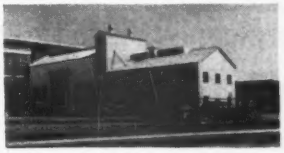

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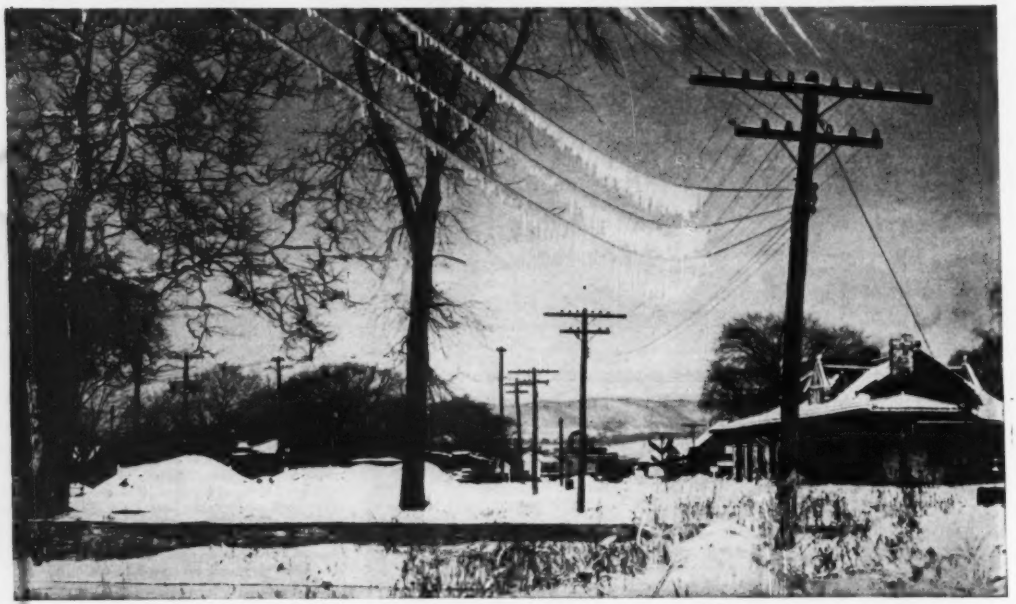

IN THE NORTH, poles must resist the tremendous weight of frequent sleet storms. Avoid preservatives which *weaken* the wood. BARRETT* Coal-Tar Creosote allows poles to retain their maximum strength, and helps to keep the poles at their best and hold the lines aloft.

IN THE DESERT, crossties broom, shatter and split from extreme dryness and heat. Solutions made with BARRETT Coal-Tar Creosote retard this, and also reduce mechanical wear of crossties through their lubricating action on the wood fibers. In poles, heavy treatment with BARRETT Coal-Tar Creosote substantially reduces checking and splitting.

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IN FRESH WATER, many preservatives leach out of wood. BARRETT Coal-Tar Creosote resists this leaching action. Being only negligibly soluble in water, it is the preferred preservative for use on submerged wood structures, or those exposed to the powerful action of rapidly flowing water.

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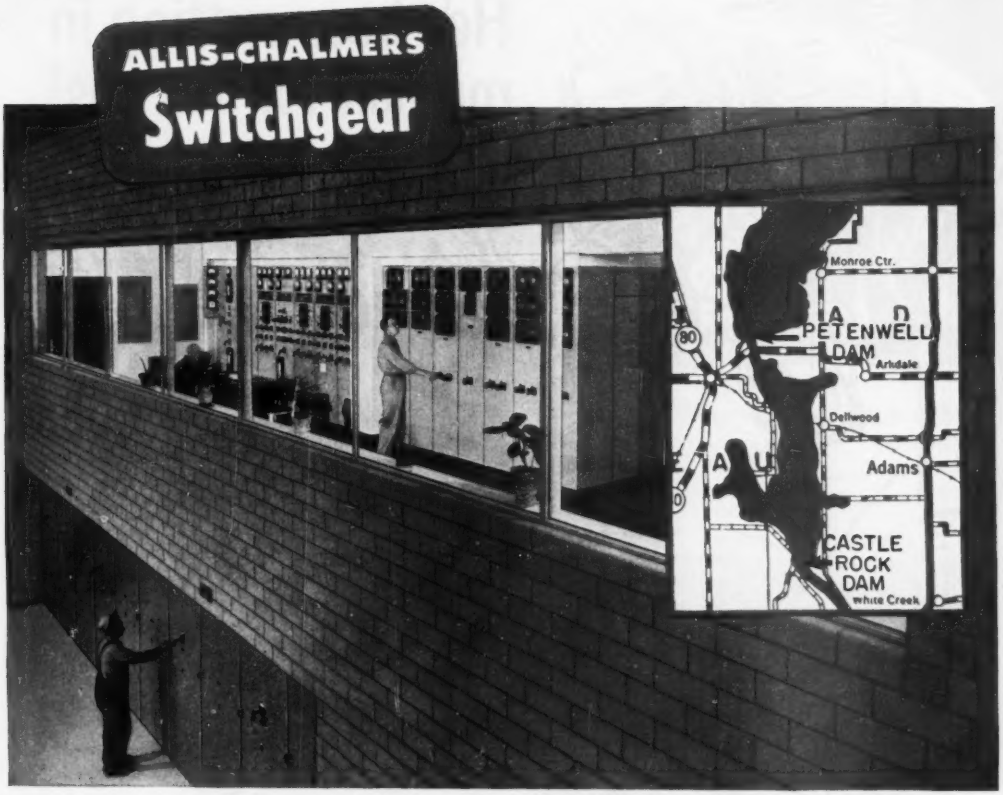

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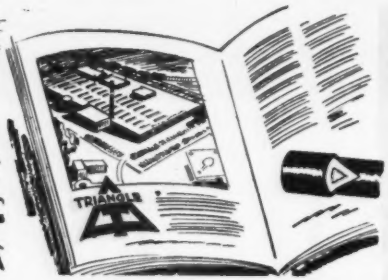

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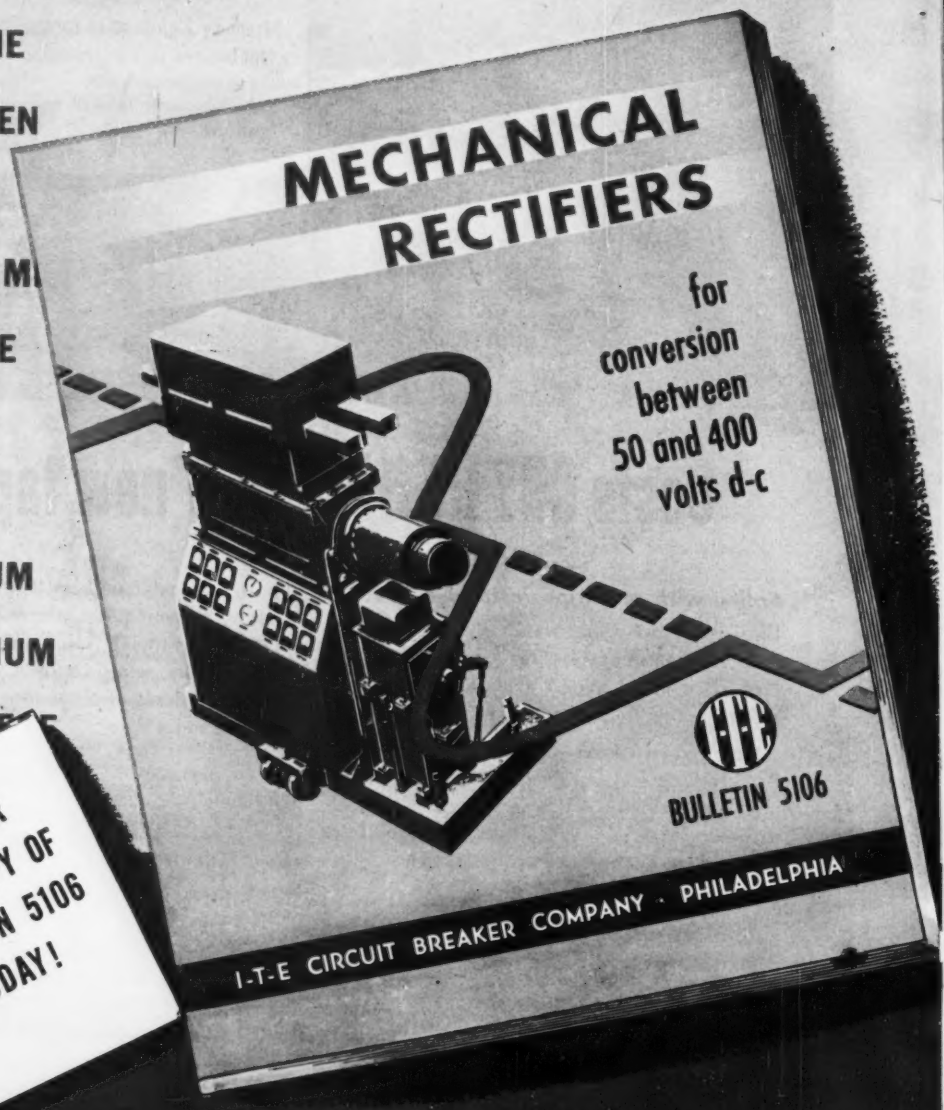

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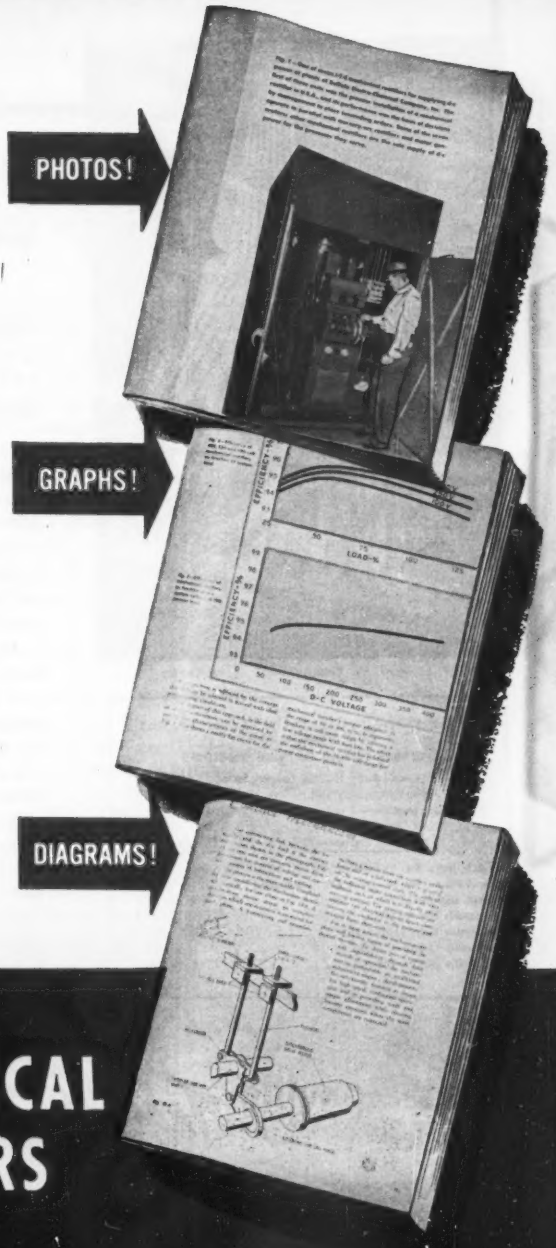

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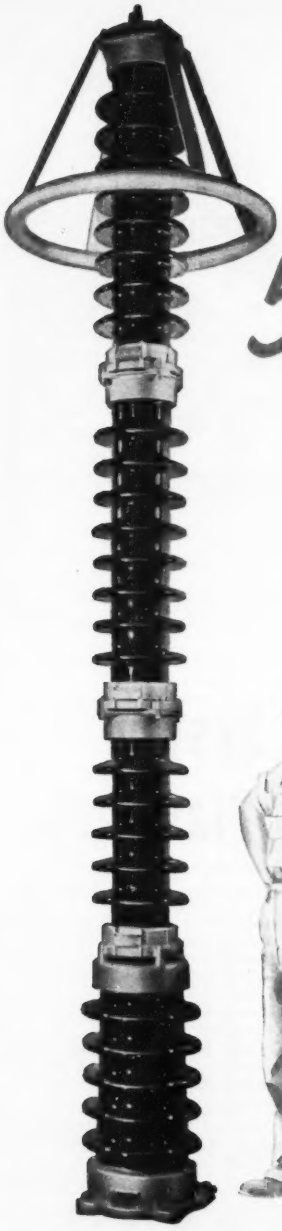

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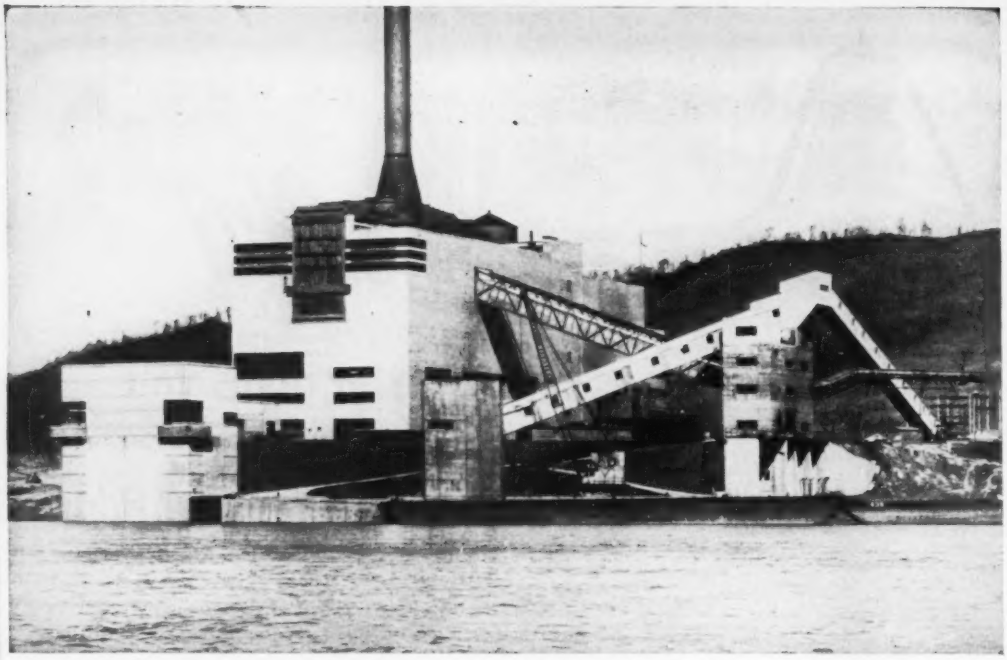
Westinghouse

SV ARRESTERS



Unique Circulating Water System Installed in This Power Plant

The R. E. Burger steam-electric plant of Ohio Edison Company is located on the Ohio River well above flood stage—which may reach as much as 60 feet above extreme low water. Water is supplied to the condensers by a patented circulating water system pioneered jointly by Worthington and the consulting engineer, Mr. George W. Saathoff.

All major equipment except circulating pumps, which are designed to operate completely submerged if necessary, are located above flood stage.

The new installation of a Worthington 70,000 sq ft two-pass condenser and auxiliaries, serving a 90,000 kw turbine-generator, is the third Worthington unit in this station. Two 46,000 sq ft condensers were previously installed.

For advice on any new installation or information on a wide range of power plant equipment, consult Worthington Pump and Machinery Corporation, Steam Power Division, Harrison, New Jersey.

HOW IT WORKS

Two full-capacity circulating pumps are used in series.* The primary pump, submerged below extreme low water, is a Worthington motor-driven HIFLO. Its high starting head characteristic is able to deliver enough water for starting purposes. A booster pump—a single-suction volute Worthington MIXFLO, mounted directly upon an hydraulic turbine—starts when there is enough water in the control well. The two pumps then operate automatically in series at full capacity.

Advantage is taken of maximum siphon effect from the condenser drop leg which enters the sealing or control well. From this well, all circulating water is passed through the hydraulic turbine. Thus the static head from sealing well to river level is utilized—75-80% being recovered—in reducing the work of the primary pump, with saving in overall pumping power.

The booster pump functions until rising water renders the turbine ineffective. Then the primary HIFLO works alone, producing full capacity under reduced head.

*In the new unit, there are two half-capacity primary pumps, permitting operation of only one in the winter when low water temperatures prevail.

Z.1.1

WORTHINGTON

WORLD'S BROADEST LINE OF STEAM POWER PLANT AUXILIARIES

Feed Water Heaters	Boiler Feed Pumps	Steam Turbines
Steam-Jet Ejectors	Water Treating Equipment	Surface Condensers

Here's why your plant needs a GAI-TRONICS Power Plant Communication System

...custom-built by Power Plant Design-Engineers!

EFFICIENCY! *Everyday-operations* run *smoother* because a modern GAI-TRONICS System is *fast* and *sure*. Critical manpower is used most effectively. Executives, operators, departments, and maintenance men are called by *name* instead of by slow, confusing code calls. Two-way or group conversations take place over special telephone handsets. These are designed for noise-free operation in *extremely high noise* areas even without acoustic booths! GAI-TRONICS has proved itself in the plants of many electric utilities throughout the United States and abroad.

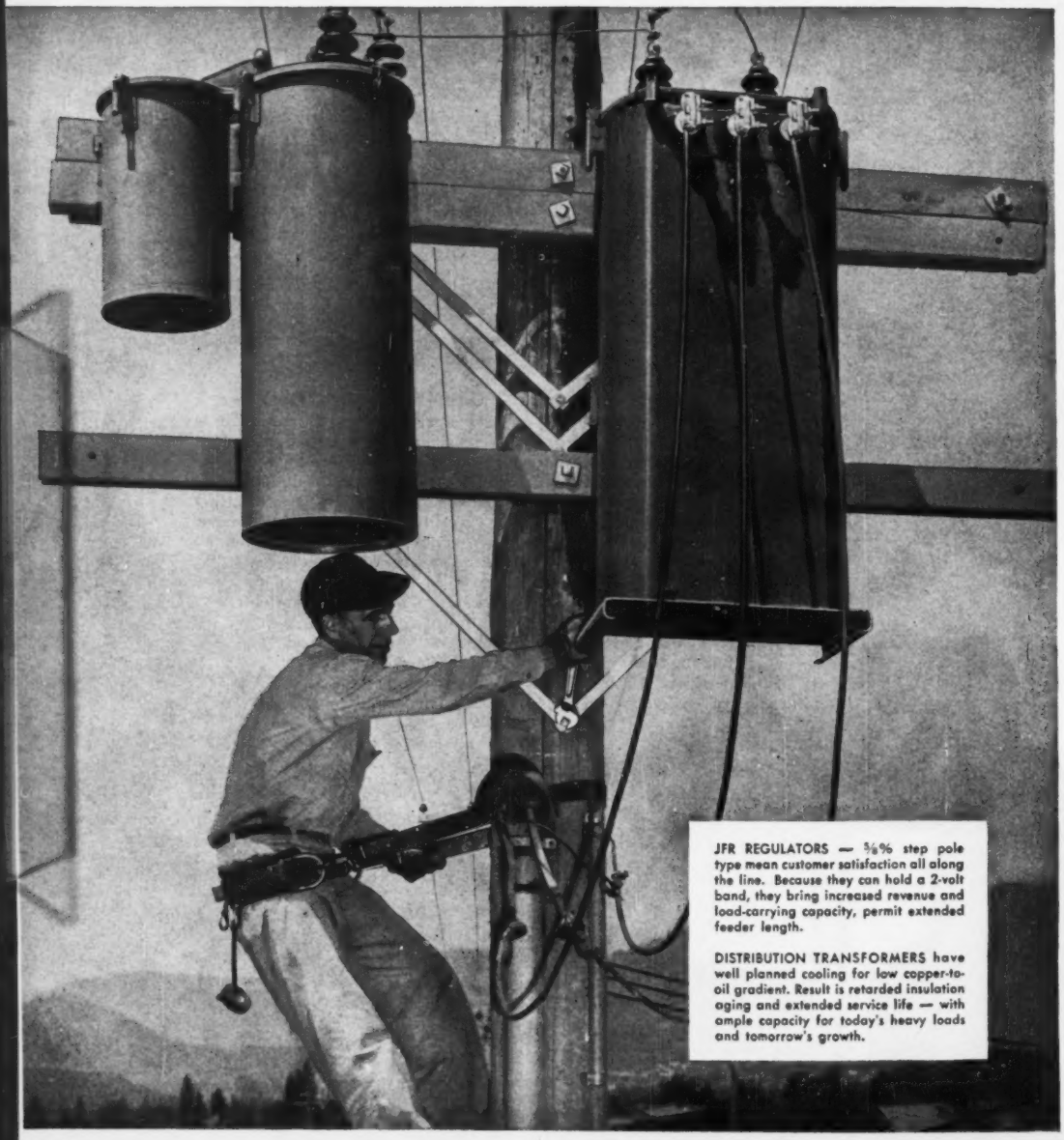
EMERGENCY! *When trouble occurs*, a GAI-TRONICS System alerts and coordinates all affected areas *by voice* at once—even though the system is otherwise in operation. All areas can hear all sides of emergency instructions, if necessary, or telephone-type privacy may be had at the flick of a switch! Maintenance men can be located and dispatched to the job without delay.

ECONOMY! *A* GAI-TRONICS *System* is surprisingly low-priced because it is designed, by men thoroughly acquainted with power plant requirements, to provide *all* internal communication facilities in *one* system! By preventing damage to costly plant equipment and keeping your plant "on-the-line" during an emergency, a GAI-TRONICS System may pay for itself in minutes! *Fast* and *sure* GAI-TRONICS communication minimizes accidents, misunderstood orders, improves labor relations, and lowers production costs.

FREE . . . a booklet or a demonstration! POWER PLANT COMMUNICATION SYSTEMS is an informative booklet showing GAI-TRONICS at work under the most difficult sound conditions. Read it before deciding on communications for your plant. It will save you money! If you should like a demonstration . . . we will bring a portable GAI-TRONICS unit to your plant and prove its worth under any noise conditions! Write today!

GAI

Here's Regulation



JFR REGULATORS — ⅝% step pole type mean customer satisfaction all along the line. Because they can hold a 2-volt band, they bring increased revenue and load-carrying capacity, permit extended feeder length.

DISTRIBUTION TRANSFORMERS have well planned cooling for low copper-to-oil gradient. Result is retarded insulation aging and extended service life — with ample capacity for today's heavy loads and tomorrow's growth.

Equipment for Power: Water Conditioning equipment, chemicals and service... Steam and Hydraulic Turbines... Generators... Condensers . . . Steam Jet Air Ejectors . . . Power Plant Pumps and Motors . . . Transformers... Circuit Breakers... Switchboards and Control . . . Switchgear . . . Unit Substations . . . Utilization equipment.

ALLIS-

Everybody Wants

—BECAUSE EVERYBODY PROFITS!

GOOD VOLTAGE REGULATION pays dividends all around. Customers get all the electricity they need. And they get full value from the power they pay for because their equipment performs better and lasts longer.

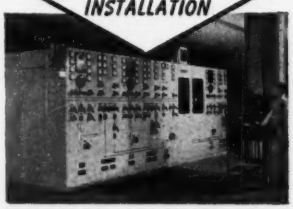
But accelerated growth is pushing peak loads near estimates made a few years ago for 1953, and regulation must be achieved in the face of expanding loads and material shortages.

Now more than ever, your experienced Allis-Chalmers representative can help you utilize the wide line of A-C equipment to solve your power distribution — and production — problems. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3488

Ruptor and *Regulex* are Allis-Chalmers trademarks.

It Pays to Keep Pace with Machinery Progress

EASY INSTALLATION

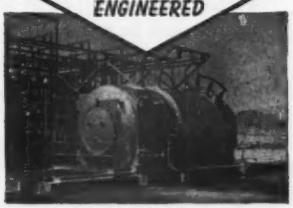


DUPLEX SWITCHBOARDS are factory assembled for economical installation. Convenient centralized secondary control for primary circuits assures good voltage regulation at the beginning of the line.

POSITIVE PROTECTION

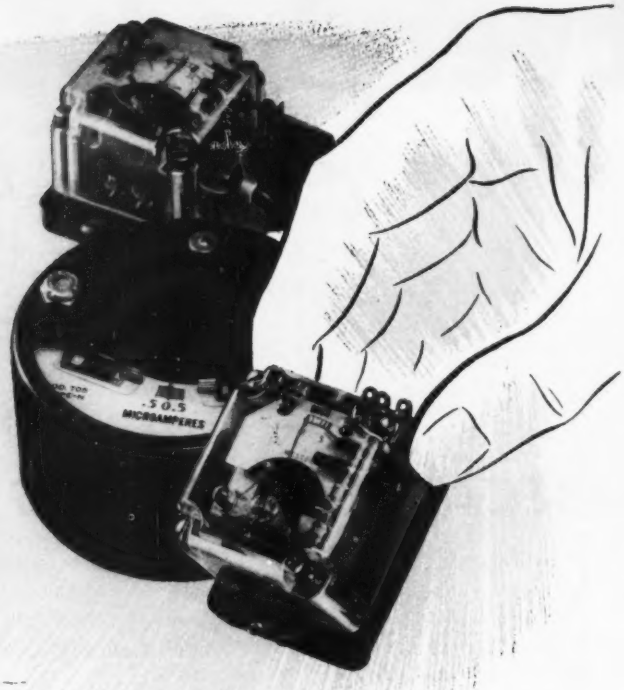
OIL CIRCUIT BREAKERS team up *Ruptor* quick-quench interruptors with mechanically trip-free pneumatic or solenoid operators to minimize system voltage variation by prompt isolation of system faults.

CUSTOM ENGINEERED



SYNCHRONOUS CONDENSERS — used indoors or out — supply reactive kva to regulate voltage and stabilize large transmission systems. Air or hydrogen cooled. *Regulex* control adds fast response to changes.

CHALMERS A-C ALLIS-CHALMERS



Boost feeble input signals with Sensitrol® ultra-sensitive relays

How many devices do *you* know of that use an amplifier to boost a feeble input signal up to where it will operate a relay? Most of them would be more reliable . . . more compact . . . more economical—if the amplifier could be omitted.

It can be omitted! For rugged Weston Sensitrol Relays operate reliably on input signals as slight as *1 millivolt* or *½ microampere*, handle substantial wattage *at 110 volts!* They require no power for excitation.

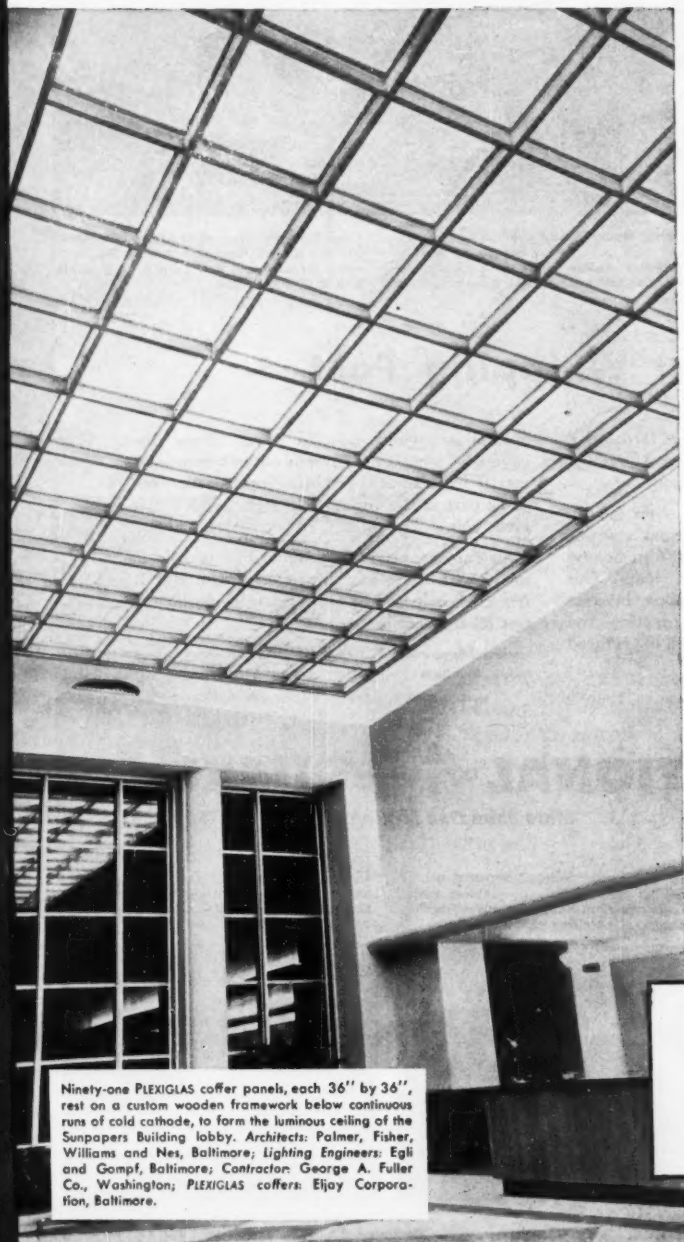
Engineering assistance is freely offered to help you adapt these Sensitrol Relays to present products, or any new problems you may have in mind. Simply consult your nearest Weston Representative, or write Weston Electrical Instrument Corporation, 594 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAGliabue instruments.

A Type for Every Need

So sensitive that they operate direct on the output of a photo-electric cell or thermocouple, Sensitrol relays enable the instrument engineer to dispense with amplifiers, vacuum tubes and auxiliary power supplies. Single or double contacts, fixed or adjustable, manual or solenoid reset. Be sure you have a copy of Bulletin B-25-B, which gives detailed data on Sensitrol and other Weston relays.

WESTON *Instruments*

How a PLEXIGLAS Luminous Ceiling Solved a Design Problem



Ninety-one PLEXIGLAS coffer panels, each 36" by 36", rest on a custom wooden framework below continuous runs of cold cathode, to form the luminous ceiling of the Sunpapers Building lobby. *Architects:* Palmer, Fisher, Williams and Nes, Baltimore; *Lighting Engineers:* Egli and Gompf, Baltimore; *Contractor:* George A. Fuller Co., Washington; *PLEXIGLAS coffers:* Eljay Corporation, Baltimore.

Problem: To light this spacious, high-ceiling lobby of the new Sunpapers Building in Baltimore, and maintain its clean architectural design. Solution: A luminous ceiling of PLEXIGLAS acrylic plastic panels.

With PLEXIGLAS luminous ceilings, lighting becomes an architectural component, not a design afterthought. The white translucent diffusers — corrugated, flat, or formed into three-dimensional shapes—conceal lamps, ducts and pipes *completely*. Yet the output of the lighting source is utilized fully, due to high transmission efficiency. The luminous area overhead is the visible source of light—a lighting fixture as big as a room.

Other advantages: Complete, uniform diffusion; high illumination levels with low source brightness; control of brightness ratios; reduction of glare, shadows, and specular reflection to a minimum; the creation of a luminous environment. And the light weight and strength of PLEXIGLAS give freedom from breakage during installation and maintenance, and safety overhead in service.

Our new booklet—PLEXIGLAS LUMINOUS CEILINGS—outlines design considerations and presents case studies. Write for your copy today.

CHEMICALS FOR INDUSTRY

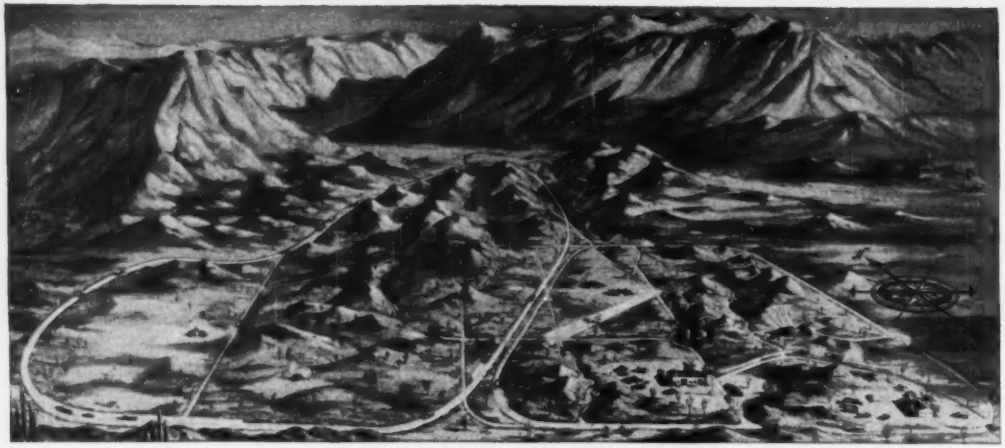
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Representatives in principal foreign countries

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

Canadian Distributor: Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street. Toronto, Ontario, Canada.



Even the buzzards need sunglasses as they wheel over the 6¼ square mile hot box that is the Phoenix Proving Ground of International Trucks. Here, Internationals are put through a rugged grind as they roll round a 7¼-mile paved test track, on a 24-hour-a-day, 34,000-mile-a-week schedule. A 4-mile dirt test track and 11 miles of success roads help provide rugged approximation of every highway condition your truck may meet. Arizona test fleet mileage now totals over 5,000,000 miles.

Desert Whipping Post

Our Phoenix Proving Ground is a whopping whipping post built to help answer this question:

How can we develop even greater truck stamina than the traditional stamina which has kept Internationals first in heavy-duty truck sales for 19 straight years? Our search for the answer is continuous, because the problem of getting lower operating and maintenance costs and longer truck life is faced by truck owners every day.

Even after 45 years of building trucks, there's always something new to learn. These discoveries—whether they come out of blue prints, actual experience, or testing operations—become part of the value an International Truck gives you.

Your International Truck Dealer or Branch is ready with the world's most complete line of trucks, to help you whip your hauling problems. Get all the details, soon.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors...Motor Trucks...Industrial Power...Refrigerators and Freezers

INTERNATIONAL HARVESTER COMPANY • CHICAGO

INTERNATIONAL TRUCKS

More than One Million Now on the Road

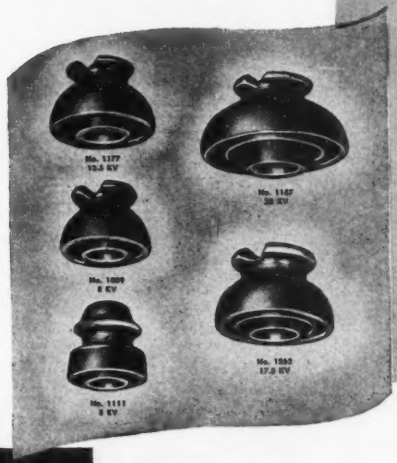
Internationals, with outriggers, are whipped around a figure-8 course to prove the capacity of front wheel spindles and wheels to withstand severe thrust.

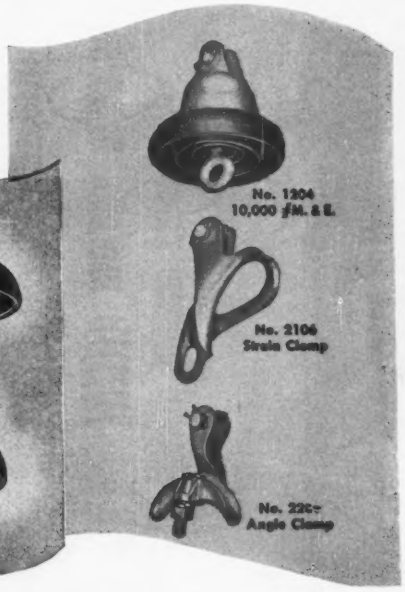
Internationals Wheel around a long curve on the 7¼-mile paved test track. Drivers report on comfort, maneuverability and general handling characteristics.

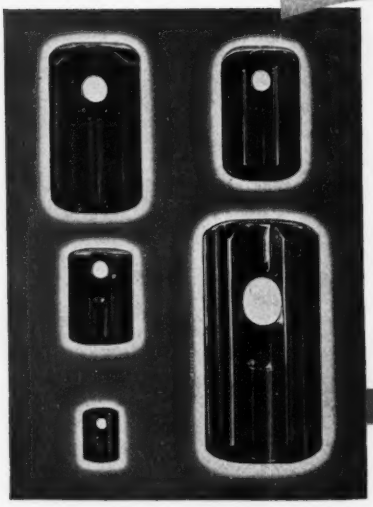
Up "The Nine" (a 9% grade that forces drivers to test gear ranges), climb units of the International Truck test fleet on their constant circling of the test track.

STANDARDS of DISTRIBUTION QUALITY

Porcelain Pioneers For 78 Years





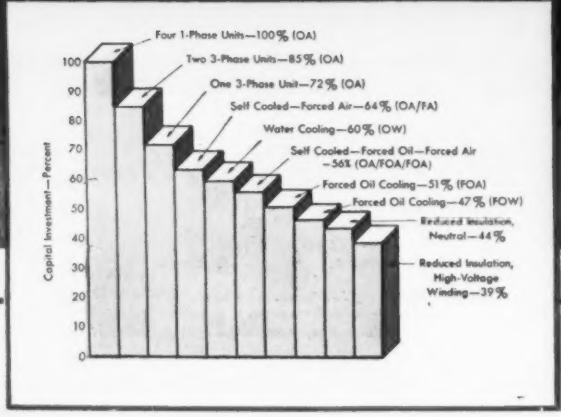


No matter what your porcelain insulator requirements, THOMAS can satisfy them . . . whether for high-voltage transmission or low-voltage distribution. Specifically, our distribution porcelain and hardware are backed by the same 78 years of ceramic experience and knowledge which distinguish THOMAS high-voltage suspension and pin-type designs. Consequently, THOMAS porcelain is the standard of comparison for discriminating engineers throughout the Electrical Industry. Make it *your* safeguard for reliable electrical distribution. *Always specify THOMAS—the best by line test.*

The R. Thomas and Sons Co.

LISBON, OHIO
NEW YORK CHICAGO

Sales Representatives: E. B. Anderson Co., *Detroit* • Paul Berry, *Oklahoma City* • Ken H. Best, *Seattle* • Butler & Land, *Dallas* • R. E. Cunningham & Son, *Los Angeles* • Electric Supply Co., *Albuquerque* • Engineer Sales Corp., *St. Petersburg* • R. F. Hamilton & Associates, *Denver* • R. H. Harper, *St. Louis* • Geo. E. Honn Company, *San Francisco* • W. J. Hugo, *Minneapolis* • Leiser & Company, *Philadelphia* • Lynn Elliott Company, *Houston* John G. Pettijohn Company, *Knoxville* • H. E. Ransford Co., *Pittsburgh* • Redmond Supply Co., *Phoenix* • J. F. Schaefer & Co., *Kansas City* R. J. Sullivan & Company, *Boston* • Tafel Electric & Supply Co., *Louisville* • Walter E. Thompson, *Birmingham* • E. E. Torkell, *Memphis* • Triangle Electric Supply Company, *El Paso* • United Electric Supply Co., *Salt Lake City* • Joe Williams, *Little Rock* • *Representatives in other principal cities*



Summation of possible reductions in investment for generating station transformer banks.

REDUCED INSULATION LEVELS

Cut Capital Investment 5% to 15%

Savings in power transformer costs amounting to 50% and more—made possible by use of three-phase units supplemented by water and forced-oil cooling—can be increased an additional 5% to 15% by reducing insulation.

If a transmission system is solidly grounded, it is often feasible to reduce insulation in the high-voltage neutral, with cost savings up to 5%. If dynamic and switching surges can be limited to 80% of normal values, insulation in the entire high-voltage winding can be reduced. This represents an additional savings of approximately 10%.

Thus, depending on the application, capital savings that range all the way from 15% to more than 60% can be realized by taking full advantage of modern transformer developments.

WESTINGHOUSE POWER TRANSFORMERS are small and lighter per kva than any other transformer on the market. As a result, you can expect these additional savings.

1. **Reduced space required.**
2. **Smaller foundations.**
3. **Smaller superstructures.**
4. **Lower field-assembly expense . . . transformers shipped more completely assembled.**
5. **Lower maintenance expense . . . rugged, all-welded construction plus smaller size.**

Yet all this is merely a portion of the savings possible with Westinghouse Transformers. Our representatives will be glad to discuss additional features that mean big savings to you. Phone today, or write: Westinghouse Electric Corporation, P. O. Box No. 868, Pittsburgh 30, Penna.

J-70581

WESTINGHOUSE POWER TRANSFORMERS ARE SMALLER AND LIGHTER PER KVA THAN ANY OTHER TRANSFORMER . . . YET THEY GIVE SUPERIOR PERFORMANCE

YOU CAN BE SURE . . . IF IT'S

Westinghouse

POWER TRANSFORMERS

MOLONEY

HiperCore

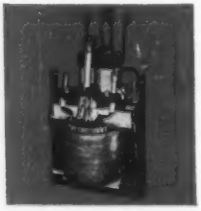
CSP DISTRIBUTION TRANSFORMERS

DESIGNED TO MEET YOUR NEEDS BETTER . . . AND MORE ECONOMICALLY!

The Moloney HiperCore CSP Transformer with wound cores of cold-rolled silicon steel combines superior operating characteristics with low maintenance costs. Operating records show the better voltage regulation and greater short-time overload capacity of the HiperCore Transformer.

The CSP equipment contributes to the low maintenance costs on these transformers. Not only are they protected against lightning surges and short circuits, but also against overloads which tend to shorten the life of a transformer.

CSP equipment consists of the following: Lightning arresters, primary fuses, tank grounding gaps (on tanks not solidly grounded), and secondary circuit breaker with indicating light (to indicate overload).



Simplicity of design of the core-and-coil unit plus liberal use of materials and adequate cooling ducts make HiperCore Transformers cooler operating and better performing, resulting in longer life under normal operating conditions.

CHECK THESE FEATURES of all HIPERCORE TRANSFORMERS

- ✓ Excellent voltage regulation
- ✓ High short-time overload capacity
- ✓ Light weight
- ✓ Small size
- ✓ Long operating life
- ✓ Low temperature gradient

MEBS-17

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers • Step Voltage Regulators • Unit Substations

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

Editorials

Evaluation of Projects

Private utility budgets for 1952 will run around $3.2 billion, 25% above 1951. In recent weeks projects have been evaluated for inclusion in the big budgets of next year. System planning indicated that the time had arrived to commence these projects. So earlier estimates were brought up to date in order that a reasonably definite figure could be put in the budget. Later on when the job has been authorized, the pencils will be sharpened and still closer figures worked out in conjunction with the drafting of specifications. Up to that point practice varies little from company to company.

But it is evident from recent discussions that the items included and the way they are adjusted and evaluated do differ materially among companies. There is more reason to be concerned about these differences than has generally been recognized. The economic assumptions and accounting techniques may not be in accordance with actual trends and company practices. Such factors have significant effect in rate reviews, the kind of equipments manufacturers make to meet industry needs, and the ultimate success of the business enterprise.

Take the topics of estimated service life, speed of deterioration, present values of future economic worth, land, and the many fringe items that can be included or omitted in the estimates. Each of these has possible variants in the method of handling. Is depreciation going to be computed on a linear or parabolic basis? What interest rate? Simple or cumulatively compound? Present day or future average cost of money? What taxes are applicable? Shall the land be bought now and carried or bought later at a premium price? Will the carrying charge be embraced in the estimates? Will housing and feeding of installation crews on remote jobs be figured in? Above all, as a truly controversial matter, will the operating losses of equipments be charged on an energy production basis, a demand basis, or a salability basis? Will accelerated amortization be assumed?

Whatever comes out of such computations determines the prudence of doing the job now or later, this way or that way. The engineer largely fixes the validity—the accountant and attorney may have different notions—and the commissions may realize that fact more and more if dissent arises.

More important even is the impact on the manufacturer. How can he know how to design his equipment for reliability, service life, and efficiency unless there is common accord among the users as to the principles followed in setting up the proposals for bid.

What the accountants do ultimately in entering the jobs on the books and how they justify their particular kind of hocus pocus are beside the point. The engineers should sense the full import of their economic evaluations. Their professional societies could offer the forums wherein the gap between cursory engineering evaluation and the refinements of academic accounting can be bridged to arrive at practical, sound, and useful uniformity in analysis.

No Free Lunch

At a recent industry meeting we heard a speaker sum up the essence of economic philosophy in nine words—"There is no such thing as a free lunch." W. C. Mullendore, able spokesman for our enterprise system, provided a graphic illustration of this truth in a recent address to a group of newspaper publishers visiting Southern California Edison Co's new Big Creek hydroelectric plant.

He took as his text the argument of those who favor socializing the electric power industry that power is a natural resource not a manufactured product. To show the extent to which even hydroelectric power is manufactured he invited the group to take a look about them to see how much nature had done toward making the reservoir, dam, tunnels, roadways, penstocks, and powerhouse. Nature, he said, has furnished about as much of the product of electric power as it has furnished of the product of a newspaper—namely the trees which are used for the paper itself.

Electricity, as he said, is a manufactured product requiring an unusual amount of capital to bring it into being and deliver it to the consumer. Comparison shows the ratio of plant investment for a dollar of gross revenue to be much higher in the electric power industry—by several times over—than in other large industries selling their products at retail.

The electric power industry is in much the same position as the colored minister who, as the collection plate was passed around, reminded his flock that salvation was free, but there was a small charge for piping it down from heaven. Electrical energy, like automobiles, farm machinery, and household equipment, is a manufactured product. Our industry should be proud of its accomplishment in harnessing, processing, and delivering a natural resource in useful form for a nominal cost.

Control Board Instruments

There is some question whether producers of mechanical instruments for power plant control rooms sense generally what has been happening in their use. A couple of decades back the control room panels had only electrical instruments on their faces. Most of the discussion was about configuration of the controls relative to the instruments and whether or not to have on and off lights to represent the open or closed position of switches, etc. Next came the drive for better lighting and still more recently, more visible and legible dials along with more uniformity in instrument dimensions.

During a good part of this period the mechanical-side instruments stayed largely in the turbine room, boiler room, pump room, etc. They could be as big as any would ask for or accept. Then came a realization among plant designers that power equipment had become more dependable and automatic auxiliaries more reliable. Naturally, in a centralized control room the next move was to put the mechanical operations under the supervision and observation of the plant operators.

That was where a change in the art took place. Murmurings of plant designers and control-room planners started simply because the mechanical instruments have not responded to these requirements.

Committees of the Pennylvania Electric Association working under Walter Morton, Pennsylvania Power & Light, have taken up this matter, and the makers of such instruments would do well to follow the lead. As in many other instances the industry may be found picking up the cudgels initially wielded by the PEA. Present instruments are much too large, and that is not a matter of esthetics or caprice. Concentration of controls in one center results in a board length and face distance from the operator unduly long if the assembled instruments are a foot or more square. Probably master instruments with telemetering of some form to miniature replicas are what is wanted.

While the manufacturers are contemplating such a trend they might as well give thought to watching the degree of standardization in dimensions, flush pattern, scales, etc of the corresponding electrical instruments. They would be better guided if they also familiarized themselves with the trends in control room lighting, in functional arrangements of instruments, and the desire for color for aid of vision and identification.

Trend to Reheat

It would be most fitting if the expression "trend to reheat" which labels this little dissertation never is used again except to refer to a transition which culminated a couple of years ago in what is now a firmly established technique. Paper after paper in five recent session symposiums on the subject at the recent ASME convention registered the complete arrival. The reports were so unanimous that they verged on the monotonous. No sacrifice in reliability or flexibility, no complexity in starting or operating or losing load, no maintenance increase. Savings of 4 to 5% or more confirmed. From here on in the purchaser of units of 50 Mw and above must prove to himself why he should not rather than why he should use reheat.

Brush Spraying

Brush-growth can be controlled by spraying with appropriate chemicals, but it makes considerable difference whether they are applied to the foliage or to the bark. Efficacy of basal-bark spraying has been discussed in the last four or five years in such technical publications as "Journal of Forestry," "Ecology," "Botanical Gazette." The proceedings of the Northeastern Weed Control Conference of 1951 are another good source of comparative information. It would mean much in spreading the work if "dormant" spraying of the bark could be an effective supplement or even alternative to "live" spraying of the foliage.

The Electrical Week

INDUSTRY MOBILIZATION (Page 79)—Directory of NPA's Engine and Turbine Division compiled by EW . . . Fleischmann warns that materials for utilities will remain scarce . . . NPA sets up four scheduling-expediting units to aid power expansion.

WASHINGTON—Red Cross adopts Nielsen method of resuscitation (p 72) . . . Atomic Energy Commission announces it expects to produce electric power at its Idaho reactor station within six months (p 74) . . . FPC may change regional boundaries for data-collecting purposes (p 74) . . . FPC checks status of California Oregon Power's Klamath River projects (p 76) . . . SEC sets hearing date on American Power & Light stock plan (p 80).

ELSEWHERE—Electrical World preliminary survey indicates industry will spend $3.8 billion for expansion in 1952 (p 75) . . . Drastic design changes are made in The Dalles Dam as government issues call for first bids (p 76) . . . Interstate Power Club meets in New York . . . GE Supply Corp announces it will reorganize and expand (p 148).

• • •

WASHINGTON—*Utilities Section of National Safety Council and Rural Electrification Administration have also adopted the Nielsen method of artificial respiration (p 72) . . . With the Harvey Machine Co deal stalled, Bonneville Power Administration is anxious to find whether there will be an aluminum plant ready to take power when Hungry Horse Project goes on the line . . . Depa Administrator James F. Fairman advises utilities seeking deferment for key employees to deal directly with draft boards or the military service involved . . . Timothy A. Lynch is named director of Aluminum and Magnesium Division of NPA . . . Robert M. Hatfield, acting chairman of Munitions Board, is leaving Dec. 22 to resume his position as general manager of Western Division of Combustion Engineering-Superheater . . . Paul B. Andrews, Revere Brass & Copper Co, takes over as deputy director of NPA Copper Division, succeeding Joseph W. Mullally who is returning to his position as manager of utility sales of Anaconda Wire & Cable.*

Washington Public Utility Districts ask Voluntary Credit Restraint Committee approval to issue $115 million bonds for purchase of Puget Sound P&L properties . . . Metropolitan Edison plans public sale in 1952 of about $8 million in bonds and 40,000 shares of preferred. Company also plans to sell about $4 million of common to parent, General Public Utilities.

J. H. Gumz, Depa regional representative, gives approval for decorative holiday lighting by merchants and lights on outdoor Xmas trees in Pacific Northwest.

The Electrical & Gas Association of New York has voted to dissolve (EW, Nov. 26, p 11).

Kentucky Municipal League is advocating a program to stop public utilities from raising their rates without a public hearing. League also favors a larger legislative appropriation for the PSC for investigating public utility rate cases . . . Missouri P&L asks PSC approval to purchase Western Light & Telephone's distribution system in central Misouri for $200,000.

Milton and Freewater, Ore., which consolidated last spring as Milton, have agreed to purchase Pacific P&L's distribution lines in the former City of Freewater and certain rural areas for $147,414.

Utilities had a record 39,318,346 tons of coal on hand Nov. 1, or 127 days' supply on October use.

Celebrating 50th anniversary of the government's participation in reclamation, Post Office Department will issue a commemorative postage stamp next year, depicting Grand Coulee Dam.

Mountain Home, Ark., City Council set Jan. 15 as the date of a special election on whether it will buy the Arkansas P&L distribution system.

Overall cost of Western Massachusetts Electric's West Springfield steam plant when two units totaling nearly 100,000 kw are installed will approximate $182 per kw, Pres Howard J. Cadwell reports.

Congratulations—Lockhart (S. C.) Power elects W. D. Dent president . . . George H. Flagg accepts a position as public relations director for Oregon Highway Council, resigning as the Oregon Public Utilities Commissioner, effective Jan. 1 . . . Public Utilities Association of the Virginias elects H. O. Sprinkle, manager of Monongahela Power's operation department, president . . . W. N. Matthews Corp elects Herbert H. Wefeler vice president in charge of sales . . . Southern Services, Inc. appoints J. M. Reynolds assistant comptroller. He resigns as vice president and assistant secretary-treasurer of Birmingham Electric Co . . . Wright Canfield, vice president of Public Service of Oaklahoma, will serve as president of Tulsa Chapter of Oklahoma Society of Professional Engineers during 1952.

Nielsen back pressure-arm lift method of resuscitation is done in five steps with the cycle repeated 12 times a minute. A Red Cross technician posed these Pepco linemen to demonstrate the proper way of applying the new system

1. Victim Is Prone

With elbows bent, one hand upon the other. The head is placed on hands with face turned slightly to the one side

Red Cross Adopts Nielsen Method

Back Pressure-Arm Lift System Replaces Schafer Method; Utilities Hesitate to Change as Present Practices Have Saved Many Lives

A new method of manual artificial respiration has been adopted by the American Red Cross and a number of other national organizations. Known as the Nielsen back pressure-arm lift method, it will in time replace the Schafer prone-pressure method.

Adoption of the new method has been under consideration for some time. The Accident Prevention Committee of Edison Electric Institute has been discussing it. The committee has taken this stand:

"The utilities have publicly shown an interest in this problem for over 40 years and as a result of the constant training of employees, many lives have been saved from electrical shock by the prompt application of either the prone pressure method of artificial respiration or, where necessary, the Oesterreich pole top method. Therefore, at the present time, the utilities hesitate to change from these tried and proven methods until it can be shown in actual cases in the field that other methods will save more lives from electrical shock."

The back pressure-arm lift method was originally described in 1932 by Holger Nielsen, a lieutenant colonel and physical education instructor in the Danish army. Since then the method has been taught and used in Europe, especially in Denmark and Norway. Reports from the Red Cross societies of these nations indicate that the method has been used with success and that there have been no injuries as a result of its use.

Chief advantage of the Nielsen method, proponents assert, is that it permits a greater exchange of air than is possible with the prone-pressure method. The Nielsen method is a two-phase operation. It permits the operator to expand the chest of the victim as well as compress it. Thus it produces active inspiration as well as active respiration.

This advantage has led to the adoption of the new method. While researchers generally have agreed that the prone-pressure method is the easiest of all to perform and teach, they also have found that the Nielsen method is simple. A child or frail adult can administer it on a heavy person without great difficulty, proponents of the new system assert.

It has also been shown that the new method is not likely to injure the subject in practice or in actual resuscitation efforts. This is particularly important in cases where the victim is suffering a back injury or has broken bones in the lower part of the body.

Military consultants recommended that the Nielsen method be adopted by the Armed Forces in June. But considerable study preceded this recommendation. Research before and during World War II in respiratory physiology and the asphyxial process contributed much knowledge in the field.

In 1947 the American Red Cross requested the Council of Physical Medicine of the American Medical Association to review the whole problem of artificial respiration. A committee of the council reported that the prone-pressure method appeared to be inferior to certain other methods. It recommended, however, that further study be made before adopting the new method.

To help out in this study the Red Cross made grants during 1948 and 1949 to evaluate various methods of artificial respiration.

These studies pointed toward the need for use of a more effective

2. Operator Kneels at Victim's Head

Starts the cycle by placing his hands on victim's back. Thumbs touch, heels of hands below line connecting armpits

3. Rocking Slowly Forward

Operator, Max G. Hamner, keeps his elbows straight until arms are nearly vertical, exerting pressure on the chest

4. Then Rocking Backward

Operator slides his hands to the victim's arms slightly above the elbows. Elmer E. Cox, Pepco lineman, is victim

5. Raising the Victim's Arms

As he rocks backward, operator continues until resistance is felt at victim's shoulder. Dropping arms ends cycle

method than the widely used Schafer method. This conclusion was supported by extensive research carried on by government and private agencies as well as individuals.

With the fund of knowledge gathered from these research efforts the Red Cross in cooperation with the Public Health Service requested the Division of Medical Sciences of the National Research Council to call a conference of consultants and interested organizations to discuss the findings.

As a result of this conference the National Research Council recommended that the method generally preferred is the back pressure-arm lift method. As of Nov. 30 these agencies had adopted the Nielsen method: the Armed Forces, American Red Cross, American Telephone & Telegraph Co. Boy Scouts of America, Bureau of Mines, Camp Fire Girls, Council of Physical Medicine and Rehabilitation of the American Medical Association, Federal Civil Defense Administration, Girl Scouts of America, Public Health Service of the Federal Security Agency, and the Young Men's Christian Association.

Agencies which have not acted on the new method include the Edison Electric Institute, Inter-American Safety Council, and the National Safety Council.

Though the Red Cross and other organizations have adopted the Nielsen method, the changeover from the Schafer method will not be immediate. Time will be needed to prepare instruction literature and to train instructors and operators. The Red Cross strongly advises continued use of the Schafer method until proficiency in the Nielsen method is acquired. Undoubtedly, it will take years to supplant present resuscitation practices.

Electric Power from AEC's Reactor in Idaho Expected Within 6 Months

First electric power from an Atomic Energy Commission reactor is expected to be produced within six months. The power will be generated by heat from the commission's experimental breeder reactor in Idaho.

"If everything goes the way we expect it to we should see this reactor produce its first power some time in the first half of next year," AEC Chairman Gordon Dean recently told a New York audience.

Power Output Will Be Small

He noted the reactor was built primarily to test the breeding process, but said it was also designed to produce power experimentally. Amount of power to be produced will be relatively small, he said.

Dean made no claims that the Idaho installation is a power reactor, but said the real, full-scale, power-producing reactor of the future will probably be one of this same general type. That is, it will be designed both to breed nuclear fuel and to produce power, thus simultaneously releasing energy while producing new sources of energy.

In this type of operation, the only waste will be the "ashes" of nuclear fission. But even these "ashes" are highly radioactive, and thus are potential sources of energy. By the end of next summer, AEC hopes to have a pretty good idea of the efficiency of the Idaho breeder.

AEC Power Use High

But while production of electricity by atomic power is still in the future, Dean said the use of electricity by AEC is very much in the present. By next June, AEC installations will be consuming power about equal to that being used by the City of New York —or roughly about 2% of the total national supply. The new uranium separation plant being built at Paducah, Ky., will have a power demand of more than one million kw.

Dean told a press conference he expects to have reports within the next month from electric utilities and chemical companies which have been studying the feasibility of using atomic energy to produce electric power. First two reports will probably come from the Monsanto Chemical Co-Union Electric Co combination, and the Dow Chemical Co-Detroit Edison Co combination.

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Power Use Cut in Bombay

Consumption of electricity in Bombay City, India, has been cut one-third, the severest power cut in the city's history. The power shortage is a result of the low rainfall during the monsoon in August and September and the consequent decline in output of the Tata Hydro-Electric System.

Interoffice Mailman

It's three miles from the main offices in downtown Salt Lake City to Utah Power & Light Co's new Operations Center, but interoffice mail moves faster between the two operations than it did when they were across an alley from each other.

The reason is the pint-sized "mail truck" above, piloted between the buildings on six round trips daily by Mack Rozelle, shown climbing aboard. Says Mack: "I carry mail, supplies, engineering data, and even a few passengers who don't mind removing their hats."

FPC Studies Modification of Boundaries of Regions

Federal Power Commission has under consideration a proposal to modify the present boundaries of its regions for data-collecting purposes.

Among the changes being discussed are the boundary of Region II on the Kentucky border, and a portion of the boundary between regions IV and VI in the Missouri area. Some staff members point out, however, that any significant change of boundaries would upset historical records that have been built up for the regions since they were established.

The commission is considering an alternative proposal for collecting supply-demand information on a pooling basis. FPC already is compiling part of its supply-demand information on this basis, but has been asked by Defense Electric Power Administration to expand the activity. If this task is undertaken by FPC, utilities will likely be given an opportunity to suggest the various groupings by which the data should be applied.

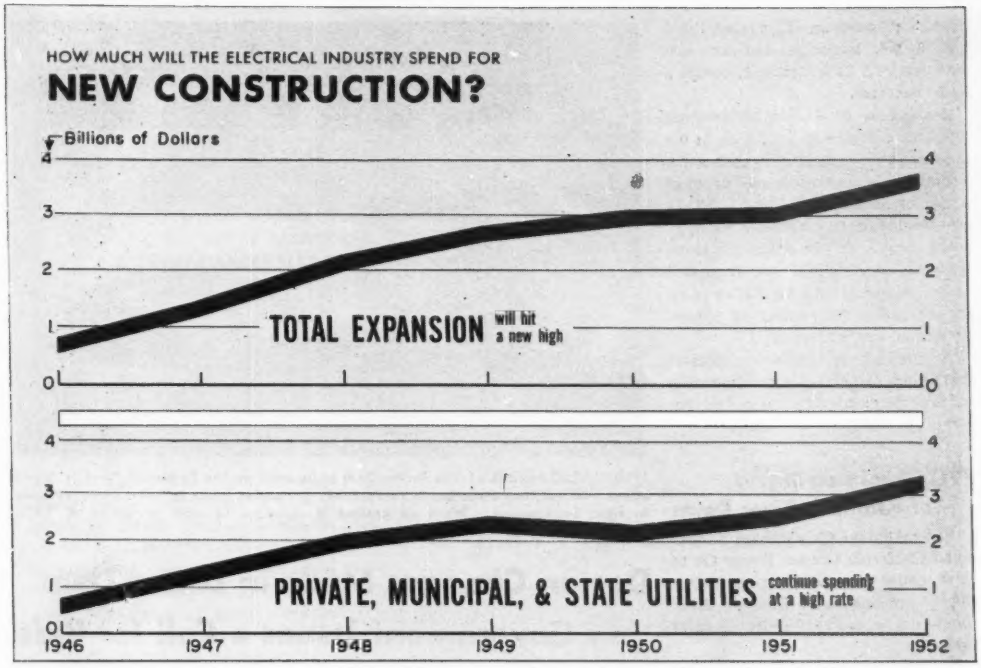
A new form would be required for collecting information. FPC staff members are drafting such a form for commission study. But before it could be adopted, it would have to be approved by the Budget Bureau. Presumably the information would be requested on a quarterly or semi-annual basis.

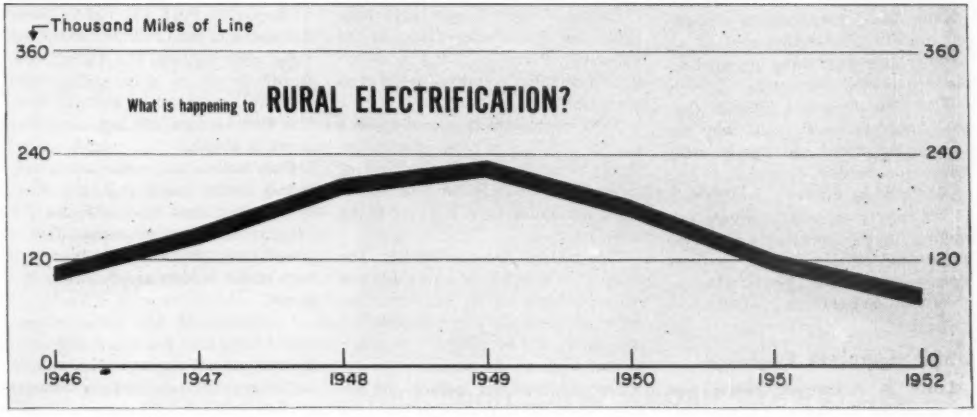
•

Paul Raver, BPA Chief, Receives Interior Award

At a recent ceremony in Portland, Interior Secretary Oscar L. Chapman conferred the department's highest award, a citation and gold medal for distinguished service, on Paul J. Raver, chief of Bonneville Power Administration.

In presenting the award, Secretary Chapman said, "The basis for this award to Mr Raver is for outstanding service in the public interest through development of the Columbia River power system as part of the comprehensive multi-purpose basin development program, and for his contribution to national power policies, nationally organized labor-management cooperation and collective bargaining agreements, and high qualities of leadership as an administrator."





$3.8 Billion for Industry Expansion

Returns from 45% of the electrical industry in Electrical World's annual survey of capital expenditures indicates electric utilities will spend nearly $3.8 billion on new construction in the coming year.

Returns disclosing private, municipal, and state budget plans for '52 show a 26% increase in spending over the $2.6 billion reported for '51. Total construction expenditures by this group is expected to approach $3⅓ billion.

Combining this with a conservative estimate of $500 million of electric co-op and federal spending brings the industry's estimated total spending for new construction to $3.8 billion.

The completed survey, covering capital budgets of electric co-op and federal operations as well as private, municipal, and state system operations, will appear Jan. 28 in Electrical World's annual statistical issue.

Reports on rural line construction by the private companies indicate a 15% decrease in the miles of line ex-

tensions planned for '52 against those built in '51. Municipal and state systems report a 22% decrease, co-ops a 37% decrease.

Decline in rural line construction indicates a degree of saturation in the number of farm customers connected. Estimates of increased use of electricity of farms (EW, Dec. 3, 1951), however, indicate a need for strengthening rural lines. To study this situation Electrical World has requested co-ops to supply information on plans for increasing the number of phases, conductor size, and voltage.

A preliminary analysis indicates that co-ops are planning strengthening of their lines to meet increased demand for electricity by farmers.

•

FPC Checks on Status of Klamath River Dams

Federal Power Commission has ordered California Oregon Power Co to show cause why its existing hydroelectric projects on the Klamath River should not be operated under a federal license.

The company was told to determine whether these developments are subject to FPC jurisdiction and, if so, whether they were being operated according to FPC regulations.

FPC also directed California Oregon Power to show cause why the commission should not issue an order prohibiting further operation of the projects unless a license is obtained.

The issue arose when the company applied for a license for a proposed project and alluded to other projects already in existence. The show-cause order must be answered in 60 days.

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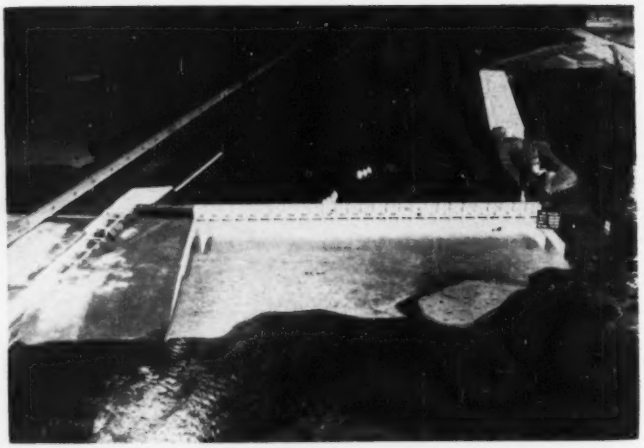
USBR Appoints Engineer

Louis B. Ackerman, career employee of the Bureau of Reclamation, had been appointed construction engineer for the Palisades Project in Eastern Idaho. A graduate of the University of Idaho, Ackerman is currently chief of the construction branch of the bureau's operations in the upper half of the Missouri River Basin.

•

Extends Utility's Franchise

Dell Rapids, S. D., has voted 307 to 18 to extend the franchise of Northern States Power Co, Minn., for another 20 years.



HYDRAULIC MODEL of The Dalles Dam to be built on the Columbia River is shown above with spillway structure in foreground, navigation locks to left and powerhouse in right background. Work on project is expected to start in spring of 1952

Design Changes Made in Dalles Dam as Government Issues a Call for Bids

Drastic design changes have been made for The Dalles Dam on the Columbia River involving a switch from a complicated curved spillway to a straight one.

These changes made recently with a call for first bids, will not affect materially the estimated $10 million of coffer dam construction and power house excavation to be included in the first contract.

Bids will be opened Jan. 22. The contract, which will be let as a whole to one bidder, will be on a continuing basis, since the last Congress appropriated only $4 million with which to start work on the project.

The $350-million project is believed to be the largest single job from a dollar value standpoint ever undertaken by the federal government. That cost includes 14 units rated at 78,000 kw each. When upstream storage is developed, eight additional units will be installed.

Model studies at the Army Corps of Engineers' Bonneville hydraulic laboratory indicated the greater desirability of the straight spillway over the curved spillway.

The Dalles Dam, fifth in the series of Columbia River dams in the federal program, will be located at the head of Bonneville Pool, 192.5 miles above the mouth of the Columbia and about three miles east of The Dalles, Ore. It will consist of a navigation lock, spillway, power house, and non-overflow dam sections, totaling more than a mile in length.

Fish ladders and power house collecting system similar to those at Bonneville Dam and those designed for McNary Dam are proposed. Downstream migrants would have access both to fish ladders and fingerling bypasses.

Completion of The Dalles project would bring total generation from five federal projects on the Columbia (not including projects on tributary streams) up to about 5.7 million kw. Already in production are Grand Coulee and Bonneville, and under construction are McNary and Chief Joseph.

•

BEA to Build New Unit

The British Electricity Authority has been granted authority by the Minister of Fuel and Power to establish a new 600,000-kw power station at Castle Donington, near Derby. The station is expected to be in operation by 1960.

4-Point Power Program Suggested by Ohio PUC

A four-point program to help insure adequate electric power supplies in the nation has been recommended to Congress by the Ohio Public Utilities Commission.

The commission pointed out that in Ohio all defense and civilian needs are being met and that in addition the state has been able to supply power to the atomic energy plant at Johnsonville, Tenn.

The PUC suggested in a letter to the Senate-House Committee on Defense Production, that Congress (1) see that planned power expansions get needed materials and equipment and get them on time, (2) realize it is shortsighted to authorize materials for building of houses and manufacturing plants unless there is enough power to operate them, (3) allocate power plant materials far enough in advance, and (4) broaden exceptions from federal jurisdiction so the maximum interchange of power between companies in neighboring states may be made in time of emergency.

TVA Fixed Assets Worth $960 Million; Revenues Off

Tennessee Valley Authority has fixed assets worth nearly a billion dollars. The agency's financial statement for the fiscal year ended June 30 shows TVA's value is $960,497,589.

Although TVA's power sales increased more than $12.5 million for the year, net revenue from power operations dropped slightly. The federal agency sold $69,826,533 worth of power netting $26,716,795. A year earlier TVA netted $27,005,954 from power sales totaling $57,259,339.

The authority pointed out that power production costs were increased by greater use of steam plants and that it had to buy more power from private utilities than it sold to them. In the 1950 fiscal year TVA delivered more power to private companies than it bought from them.

During the year TVA paid off $5 million of its bonded indebtedness, leaving a balance of $44 million. The agency also paid the federal government $4 million. It has returned $42,144,796 to the federal treasury since TVA was created in 1933.

Bonneville's High-Line Helicopters . . .

May Soon Carry Repair Crews

Now it's mainly an inspection job, with a Bonneville Power Administration lineman-observer checking the highlines from a low-flying, slow-flying helicopter (top picture). But before long, BPA hopes, large cargo 'copters will be flying entire maintenance crews and equipment into trouble spots in areas inaccessible from the ground.

Then, when routine patrols (such as the one Pilot Robert Murray and Lineman-Observer Wallace Hartness are about to fly, lower picture) find something amiss, the two-seater can radio back to have the larger craft and crew follow through.

BPA began air-patrolling its lines in 1949 with two 'copters and two pilots (EW, April 24, 1950, p 82). Now a third has been added as a spare. The present schedule calls for eight helicopter and two supplemental ground patrols annually. Last year, the 'copters flew 30,000 miles, covering major grids once every six weeks.

NEW DIRECTORS of Interstate Power Club are (standing)—J. H. MacNeal, Staten Island Edison Corp; George Digh, Atlantic City Electric Co; Frank R. Auchy, (retiring chairman), Philadelphia Electric Co; Frank C. Hersh, Pennsylvania Power & Light Co. Other officers (seated) are Harry Doyle, sec.-treas., and R. T. Kaighin, chairman, both of Public Service E&G; and E. B. Haskell, vice chairman, United Illuminating Co

Whitewell Bids Power Club Learn, Spread Facts about Public Power

"Know the facts about public power and tell them to your friends," was the plea of George E. Whitwell, vice president of Philadelphia Electric Co. He made it at the 25th anniversary meeting of the Interstate Power Club held Dec. 10 at New York.

Whitwell said that 20% of our business is already gone, and we'll never get it back. Already 45 investor-owned utilities have completely disappeared. He said that the way in which power sales engineers have helped their industrial customers with their many problems undoubtedly has had something to do with the recent trend in public thinking in favor of the privately owned and operated power companies.

Clifton A. Walter, editor of "Load Magazine," narrated for the General Electric Co slide film, "Invisible Battalions," which was made expressly for power engineers. It depicts the ever-increasing use of electric power in America's march of progress. This film is available without charge to utility power sales departments.

The electric power outlook for 1952 is more serious than it was at any time in World War II, in the opinion of R. F. Brower, consultant, Defense Electric Power Administration. He said that even with a perfect system of allocation, the cold facts are that there are not enough steel, copper, aluminum, and other materials to satisfy all defense and civilian needs.

Duncan B. Cox, president of Cox & Co, told the group of a number of new heating mediums, recently developed for the military, which present many new fields of application to the power sales engineer. He said that one type of heating unit developed for cemented-in-place applications requiring a "gentle" heat and designed for 30 w per sq ft, withstood a laboratory test of 66,000 w per sq ft without change in resistance or any other difficulty.

Another heating unit in a ribbon form using fuse wire protected by glass fibers and polyethylene is designed for pipe heating. A radiant heating panel designed for shipboard ceiling or bulkhead installation was demonstrated. He said it was designed to withstand any amount of overload, shell fire, and vibration without sparking hazard and would have industrial applications such as requiring large radiation levels in hazardous areas.

Con Ed Program to Curb Smoke to Cost $3,739,500

Consolidated Edison Co of New York plans to spend $3,739,500 during the next three years to cut down the emission of smoke at three of its generating plants in New York City.

The program calls for modernization of boilers at the Hell Gate, Waterside No. 2, and East River plants. The company believes these improvements will bring smoke emissions from the plants well within the limits of new regulations issued by the city's Smoke Control Bureau.

Con Ed recently lost its fight to prevent prosecution in Magistrate's Court for violations of the Smoke Control Law (EW, Dec. 10, p 19).

The utility's plans were announced in a letter from G. R. Milne, Con Ed mechanical engineer, to W. G. Christy, director of the Smoke Control Bureau.

Christy said last week he was pleased that the company was trying to curb the emission of smoke from its plants. He declined to comment on the adequacy of the program until he had seen detailed plans.

Milne said that it would take three years to make the improvements because of the difficulty in obtaining materials and equipment and because the construction work would have to be arranged so service to customers would not be interrupted. The company has applied to Defense Electric Power Administration for permission to buy the needed equipment and make the installation.

That Accounts for It

"Please discontinue stamping my bills with the year date '1950'," wrote a customer to the Puget Sound Power & Light Co. at Seattle, Wash.

The company was unable to comply with the request: "1950" was the customer's account number.

Engine and Turbine Division—National Production Authority

(prepared by Electrical World, Nov. 15, 1951)

Office of the Director
Director—Otis Howard (X4202)
Deputy Director—E. J. Hand (X4202)
Labor Advisor—W. A. Calvin (X4289)

Coordination Section—Chief, Everett Welch (X5077)
A. M. R. Lawrence
Robert L. Dombey
A. J. Timmes
John Alvanas

Program and Statistics Section—Chief, George J. Roewe (X3945)
Ruth Getts

Hydraulic Turbines Section—Chief, Oscar A. Arnold (X4810)
Harry C. Murto

Steam Turbine Section—Chief, Philip J. Robinson (X3936)
George A. Ball
Wiley B. Ford

Boiler Section—Chief, F. X. Gilg (X4888)
Francis A. Schroff
R. F. Martin
C. J. Grossi
E. F. Kuehnle

Condenser Section—Chief, M. J. Kilroy (X4707)
H. C. Hoover
William B. Lee
W. G. Warren

Internal Combustion Engine Section—Chief, R. N. Tate (X4811)
H. G. Bryan

Water Treatment Section—Chief, Edward Aldworth (X3310)
Henry Dollar

Heavy Metal Tank Section—Chief, George Connors (X3326)
Paul T. Dowling
Ruth Askin

Fabricated Pipe Section—Chief, Tom Owen (X3946)

Offices are in the North Wing, 2nd floor, of New General Accounting Office Building, 5th and H Sts., NW, Washington 25, D. C. Telephone extensions (X) are on STerling 5200.

Materials for Utilities Will Remain Scarce, Advisory Council Warned

There is little prospect for any substantial change in the materials situation for the electric power industry in the immediate future. This was the conclusion of a number of persons who attended the Electric Utility Defense Advisory Council meeting in Washington, Dec. 6.

Manly Fleischmann, head of Defense Production Administration and National Production Authority, gave an overall picture of the defense production effort. But there was no promise of a larger share of materials in the next few quarters. Quarterly demand for some scarce materials is still running 150 to 175% of supply.

James F. Fairman, Defense Electric Power administrator, noted that the power expansion program for next year calls for installation of some 10 million kw of capacity. "However," he warned, "if the material shortages which have thus far handicapped the program continue, it is unlikely that this figure can be reached."

Discussing power supply and demand for next year, he estimated total capacity requirements at the year's end would be close to 85 million kw. If the whole 1952 program is achieved, he continued, the generating capability will be slightly less than 85 million kw.

"Thus, failure for the third successive year to increase the margin between supply and demand means that during 1952 we can expect greater areas in which the power supply will be precarious," Fairman warned the council.

On this same topic, Fleischmann promised to make public the report on the nation's electric power supply and requirements now being prepared by the Morehouse committee. Reminding the council that he is under no compulsion to abide by the report, he said it would be made available for industry study soon after it is completed.

These were some of the other points made at the meeting:

1. Water conditions in the Pacific Northwest virtually assure sufficient electric power to prevent any further extended curtailments during the current season.

2. Utilities, both public and private, are doing a pretty good job of furnishing Depa personnel, but more men from industry will be needed if the job rotation plan is to run smoothly.

3. Government studies are continuing on security measures for utility plants in a national emergency.

NPA Sets Up 4 Units to Aid Power Expansion

Scheduling-expediting units are being set up in four National Production Authority divisions which have a part in the electric power expansion program.

Similar units are being set up in all other industrial divisions of NPA as a means of speeding delivery of components first for the military production program, and second, for defense supporting industries.

The new units will be empowered to render spot assistance to manufacturers in turning out pieces of key equipment. In some cases this will mean use of directives or DO orders and probably eventual scheduling of components.

The new units will also help manufacturers place orders for authorized controlled materials. This is the kind of assistance Defense Electric Power Administration has been rendering through its construction expediting branch.

FINANCIAL

YIELDS (%) — Operating Electric Utility Securities

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1951									
Dec. 6	3.01	3.08	3.18	4.28	4.50	4.82	5.38	6.16	6.80
Nov. 29	2.99	3.07	3.17	4.28	4.49	4.80	5.45	6.18	6.89
END OF QTR.									
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.09	3.11	3.23	4.11	3.37	4.68	5.73	6.38	7.78
1st 1950	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.90	7.13
4th 1950	2.65	2.67	2.78	3.86	4.14	4.51	5.80	6.54	7.44

Data: Reis & Chandler, Inc.

AP&L Stock Plan Hearing Is Set for Jan. 8 by SEC

A hearing has been set for Jan. 8 on the American Power & Light Co's plan to distribute to its shareholders the stock of its subsidiary, Washington Water Power Co.

At the same time, the Securities and Exchange Commission ordered a hearing on the plan of Electric Bond & Share Co to get rid of whatever WWP stock it may acquire as a result of American's distribution.

Both hearings will be held on Jan. 8 in Washington before SEC. American's plan will come before the commission at 10 A. M. and Electric Bond & Share's plan at 2 P. M.

However, the order for the hearings assumes that American will not file a notification of sale of the WWP stock before the Jan. 1 deadline set by the commission in an opinion handed down in mid-October (EW, Oct. 22, p 96.

American is under order of SEC to get rid of the WWP stock as rapidly as possible. However, Howard Aller, president of American, has been insistent that he be allowed to sell the WWP stock to Pacific Northwest interests including three Washington Public Utility Districts.

At a hearing this summer before SEC Aller asked that no action be taken to force American to distribute its stock before Jan. 1. By that time, he said, he hoped to have arranged a sale of the stock. This request was granted by the commission, but Aller was told to file a distribution plan by Nov. 5 to be used in case a sale had not been arranged by Jan. 1.

The plan (EW, Nov. 12, p 20) set forth terms of the distribution, but stated it would not be effective if hearings on it were held prior to Jan. 1.

As far as the commission could determine early last week, there was no indication that a notification of sale would be filed by the deadline.

FINANCIAL BRIEFS

Appalachian Electric Power Co has asked Virginia State Corporation Commission and West Virginia Public Service Commission approval to increase rates $5.6 million annually. Virginia SCC has set a hearing for Jan. 14.

Long Island Lighting Co has received special Treasury citation for promoting the purchase of U. S. defense bonds through the Payroll Savings Plan. Judge Leone D. Howell, chairman of the Nassau County, N. Y. Advisory Committee of the Treasury Department congratulated the company for being the first large company in Nassau County to attain 57% employee participation, and for having the highest participation of any utility company in the country.

Northern Indiana Public Service Co common stockholders exercised rights for 102,725 shares of 240,000 shares of 4.56% convertible preference stock on 1-for-12½ share basis at $24 per share; balance of 137,275 shares were taken by Central Republic Co, Blyth & Co, and Merrill Lynch, Pierce, Fenner & Beane group, underwriters.

Southwestern Public Service is planning to raise about $4 million through the issuance of rights for common stock about Feb. 1 in ratio of one new share for each 13 or 14 shares held.

Public Service Electric & Gas Co stockholders will vote Jan. 17 on a proposed increase of its authorized preferred stock from 500,000 to 1 million shares . . . **Florida Power Corp stockholders** will vote Jan. 11 to consider authorizing and issuing 51,550 shares of cumulative convertible preferred.

Central Vermont Public Service Corp has asked SEC approval to issue or renew, during the first four months of 1952, or until the company has completed permanent finances, up to $2.1 million in notes.

Electric Utility Financing

Company and Description	Amount of Offering (000)	Offering Price	Yield at Price to Public
WEEK OF DECEMBER 6-12			
Bonds			
Virginia Electric & Power—1st and ref mtg 3¼% 1981 new money	$20,000	102.869%	3.225%
Long Island Lighting—1st mtg 3⅝% 1976 new money	25,000	101.20	3.55
Common Stock			
Public Service Co of New Hampshire—235,809 sh, $10 par new money	$ 5,453	$23.125	7.78
WEEK OF DECEMBER 13-19			
Bonds			
Niagara Mohawk Power—gen mtg 1981	$15,000	.....	.....
Preferred Stock			
Iowa Southern Utilities—100,000 sh cum $30 par conv	$ 3,000	.....	.....
Common Stock			
Central Maine Power—315,146 sh (being offered to 6% holders on 5-for-7 basis and to common holders on 1-for-7 basis, record Dec. 5 to expire Dec. 17; New England PS, holder of 49% of common waiving its right to subscribe for 150,740 shares of new shares which will be sold publicly)	$ 5,554	$17,625	6.81%
Niagara Mohawk Power—1 million sh	.....	.....	.....
SCHEDULED DECEMBER-JANUARY			
Bonds			Bid Date
Seattle, Wash.—municipal light and power rev, 1962-1986	$28,000		Jan. 8
Philadelphia Electric—1st and ref mtg 1982	35,000		*Jan. 9
Indiana & Michigan Electric—1st mtg 1982	17,000		Jan. 22
Indiana & Michigan Electric—serial notes 1956-1967	6,000		Jan. 22

*To be offered by Drexel & Co and Morgan Stanley & Co group, underwriters.

September Energy Sales Increase 11.2% Over '50

Electrical energy sales during September were 11.2% higher than those for the same month a year ago.

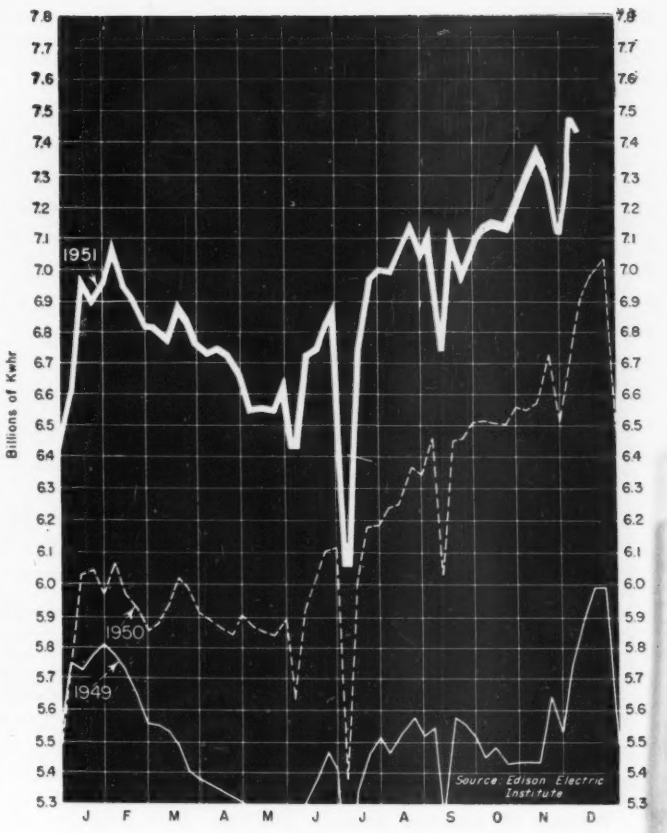
Electric utilities sold 26,866,559,000 kwhr to ultimate customers in September of this year compared with 24,156,684,000 in September, 1950. Revenue from ultimate customers totaled $476,787,500, or 10.7% more than the $430,679,900 received in September of last year.

Average usage per residential or domestic customer reached 1,961 kwhr in the 12 months ended Sept. 30, 1951, an increase of 9.6% over the 1,789 for the year before.

The average annual bill amounted to $55.50, up 7% over the 12 months ended Aug. 31, 1950. Revenue per kilowatthour declined 2.4% from 2.90¢ to 2.83¢.

Classification of Sales, September

Kilowatthour Sales September	Million Kwhr 1951	Million Kwhr 1950	Per Cent Change
Residential or domestic	6,056	5,256	+15.2
Rural (distinct rural rates)	980	836	+17.3
Commercial or industrial			
Small light and power	5,033	4,434	+13.5
Large light and power	13,413	12,301	+ 9.0
Street and highway lighting	268	249	+ 7.8
Other public authorities	661	593	+11.4
Railways and railroads			
Street and interurban railways	247	260	— 5.0
Electrified steam railroads	168	187	—10.2
Interdepartmental	40	42	— 4.2
Total to ultimate customers	26,867	24,157	+11.2



MEETINGS

Edison Electric Institute
Accident Prevention Committee, Hotel Roosevelt, New Orleans, January 7-8, 1952; Electrical Equipment Committee, Netherlands Plaza Hotel, Cincinnati, Ohio, February 11-12, 1952; Transmission-Distribution Committee, New Hotel Jefferson, St. Louis, February 14-15, 1952; 18th Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 31-April 3, 1952.

American Institute of Electrical Engineers
Winter General Meeting, Hotel Statler, New York, January 21-25, 1952.

Instrument Society of America
1952 Regional Power Plant Instrumentation Conference, New York Section, Hotel Statler, New York, February 7-8, 1952.

Public Information Program
East North Central Region Meeting, Fort Wayne Hotel, Columbus, Ohio, February 19, 1952.

American Society for Testing Materials
Spring Meeting-Committee Week, Hotel Statler, Cleveland, March 3-7, 1952.

★Illuminating Engineering Society
South Pacific Coast Regional Conference, Hotel Sir Francis Drake, San Francisco, March 13-14, 1952; Southwestern Regional Conference, Hotel Tulsa, Tulsa, Okla., April 6-8, 1952; Southern Regional Conference, Hermitage Hotel, Nashville, Tenn., April 20-22, 1952; Canadian National Conference, Hotel General Brock, Niagara Falls, Ontario, Can., April 30-May 2, 1952.

National Association of Corrosion Engineers
Annual Conference, Buccaneer Hotel, Galveston, Tex., March 10-14, 1952.

★Southeastern Electric Exchange
Engineering-Operation Section Conference, Jung Hotel, New Orleans, La., March 13-14, 1952; Annual Conference, Boca Raton Hotel, Boca Raton, Fla., April 21-23, 1952.

★Pacific Coast Electrical Association
Operating Economics Section Conference, Hotel California, Fresno, Calif., March 20-21, 1952; Administrative Services Section Conference, Los Angeles, April 17-18, 1952; Business Development Section Conference, Hotel Huntington, Pasadena, Calif., April 24-25, 1952.

American Society of Mechanical Engineers
Spring Meeting, University of Washington, Seattle, March 24-26, 1952.

Pennsylvania Electric Association
Winter Meeting, Relay Committee, Fort Stanwix Hotel, Johnstown, Pa., February 20-21, 1952; Prime Movers-Electrical Equipment Committees, Benjamin Franklin Hotel, Philadelphia, February 28-29, 1952.

★Public Utilities Advertising Association
Annual Convention, Hotel Radisson, Minneapolis, Minn., May 8-9, 1952.

Oklahoma Utilities Association
Annual Convention, Biltmore Hotel, Oklahoma City, March 27-28, 1952.

★Rocky Mountain Electrical League
Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 20-22, 1952.

★ Addition this week.

Output Week Ended Dec. 8—7,443,964,000 Kwhr

Weekly Output, Millions Kwhr						Per Cent Change from Previous Year		
1951		1950		1949		Dec 8	Dec 1	Nov 24
Dec 8	7,444	Dec 9	6,909	Dec 10	5,881	New England	+ 4.1	+ 5.8	+ 3.3
Dec 1	7,476	Dec 2	6,716	Dec 3	5,743	Mid-Atlantic	+ 5.9	+10.9	+ 9.0
Nov 24	7,157	Nov 25	6,508	Nov 26	5,537	Central Industrial	+ 3.8	+10.3	+ 6.3
Nov 17	7,333	Nov 18	6,728	Nov 19	5,644	West Central	+ 8.6	+10.8	+10.2
Nov 10	7,396	Nov 11	6,574	Nov 12	5,435	Southeast	+ 8.2	+ 9.7	+12.5
Nov 3	7,319	Nov 4	6,551	Nov 5	5,435	South Central	+22.0	+23.2	+19.9
Oct 27	7,234	Oct 28	6,563	Oct 29	5,433	Rocky Mountain	+11.3	+13.8	+11.8
Oct 20	7,149	Oct 21	6,503	Oct 22	5,430	Pacific Coast	+10.8	+12.1	+12.1
Oct 13	7,160	Oct 14	6,509	Oct 15	5,481				
Oct 6	7,156	Oct 7	6,514	Oct 8	5,450	Total United States	+ 7.7	+11.3	+10.0

WASHINGTON COMMENT

JESSE MOCK

It is taking a steady educational campaign in Washington to make the defense planners aware of the vast amount of materials needed to keep electric power expansion in step with other parts of the mobilization program.

Claimant agencies for the utilities and equipment manufacturers did not at first realize the need for the campaign. They had the idea that the material pie-slicers would listen to reason and take the word of respected leaders in the electric industry.

Allocators Did Not Know Industry's Needs

Unfortunately this did not work. The men who made the material allotments, for the most part, knew little more about the requirements of electric utilities than the average layman. Most of them knew a power plant only as some vine-covered, well-landscaped building sitting quietly by the roadside.

This lack of information was reflected in the reduced allotments handed the claimant agencies for the power industry. For instance in the original third quarter allotments for this year, engine and turbine manufacturers received about 30% less controlled material than they had requested.

Since this heavy equipment is the anchor post of all power expansion, the industry was worried. Lack of materials for these long lead time items was bound to cut into the expansion program in late 1952 and early 1953 unless changes were made.

But Educational Campaign Is Underway

Although the educational campaign had begun previously on a smaller scale, it was stepped up in the summer of this year. Members of Defense Production Administration's Requirements Committee began receiving short letters, pamphlets, graphs, and pictures to explain the material needs of the electric industry. These came from National Production Authority's Engine and Turbine Division and Electric Equipment Division and from Defense Electric Power Administration.

One pamphlet was a picture story of the construction of a huge steam plant, stressing the large amounts of steel used. Another pamphlet pictured construction of a heavy transmission line. Others detailed the material needed to build turbines, boilers, and heavy transformers. One of the claimant agencies even used color movies to get its story across, and Washington's top materials man, Manly Fleischmann, was on hand for the showing.

Pressure for more materials for the industry comes at the quarterly presentation of requirements. But in between times, there is the continuing effort to teach the allocators the basic needs of the power industry.

Although material allotments for the first quarter of 1952 are still discouraging, the education campaign already is having some effect. For instance, the Engine and Turbine Division received allotments for the first quarter amounting to more than 90% of its request. The other two agencies for the electric power industry are still running well below that figure, but there is the feeling that the tide is beginning to turn.

In selling the need for materials for the industry, the educational campaign has also helped to underline the vital role of electric power in the mobilization program. This is shown time and again in the speeches, testimony, and news releases from NPA and DPA. Hardly a statement is made by the top mobilizers that does not contain some reference to the industry.

While this educational campaign has been going on within the mobilization set-up in Washington, there is a less vigorous campaign being carried on for the public at large. In the long run, this is even more important. For the mobilizers are sharply conscious they must have public backing in this sort of half-war, half-peace mobilization.

Once the public is convinced of the material needs of the power industry, the claimant agencies in Washington will have a much easier job convincing the mobilizers of that need.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Transformer-differential relays can be counted upon to function on ground faults if the ground-fault current is comparable to the phase-fault current.

Open discharge resistors may not effect the failure of a capacitor in service but it will constitute a hazard to personnel.

Dieselization of American railroads by 1949 had displaced consumption of 51 million tons of coal; in 5 years an additional 20 million tons will be lost to oil.

Load factor improvement in natural gas transmission will accentuate the difficulties in meeting peak demand in severe winter weather.

Endosmose (attraction of moisture to negative pole) explains why it is better to test control cables for insulation integrity with the conductors negative.

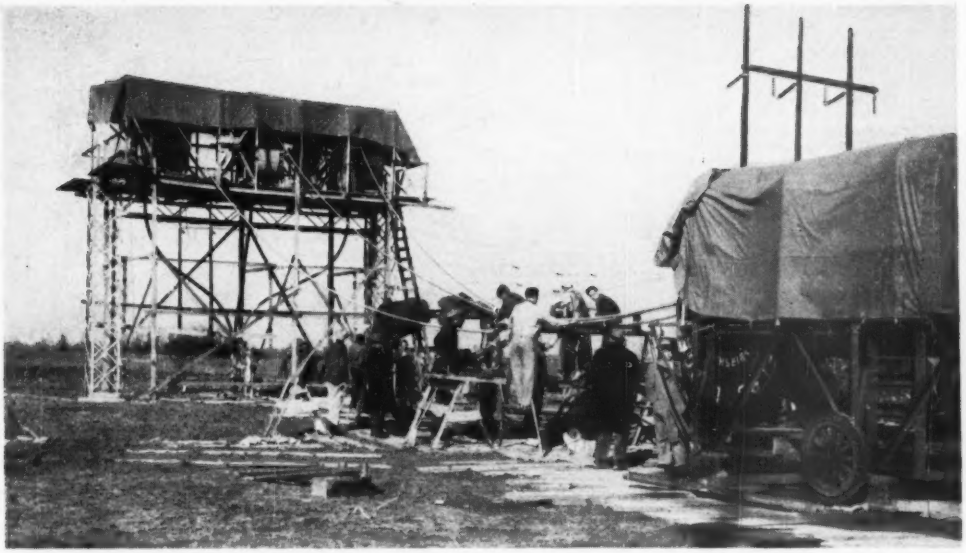
Gallium, a by-product of lead and zinc extraction, will melt in the hand but below 85 F it resolidifies; it boils at 3500 F.

Ball-point pens make good curve-tracers for circuit-breaker travel devices if the arm is changed to afford a proper angle of paper contact.

Lignite can be burned in pulverous state if exploded, cereal-fashion, from 500 psi steam pipes into the furnace.

Silicone fluids look promising for surface treatment of power-line insulators to prevent bonding of contaminants in polluted atmospheres; silicones are incompatible with most other materials.

Preventive maintenance intervals can be lengthened, admittedly, after a good showing, but one big equipment failure could wipe out all the savings—and more.



HIGH-PRESSURE, oil-filled 115-kv cable was brought up on risers of this type. Ten miles of this type cable was installed

Memphis Buys Pipe-Type Cable Complete and In Place

Careful planning, complete specifications, and detailed inspection during work progress made it possible to purchase a complete pipe-type, 115-kv, high-pressure, oil-filled cable system in place—and save money doing it

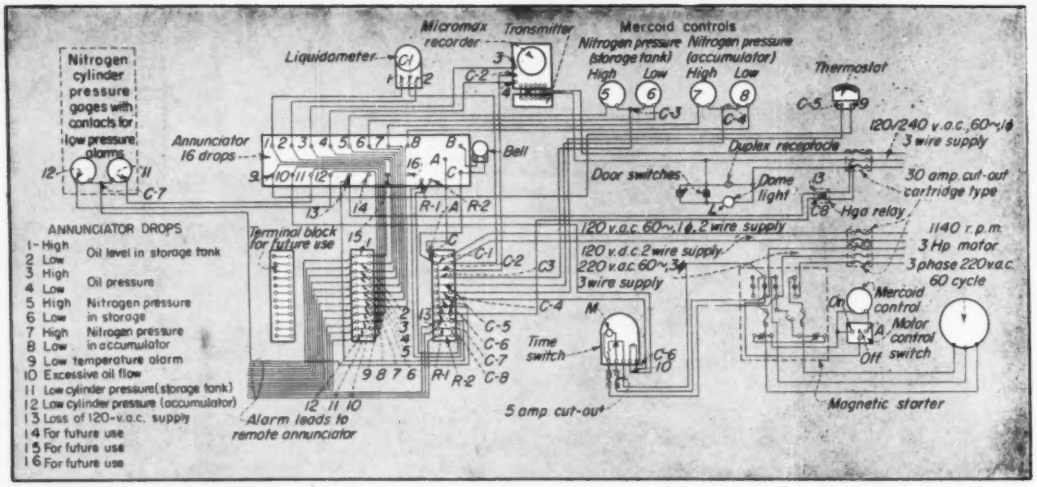
JOHN C. PARKER, Supervisor, Insulation Test Department
Memphis Light, Gas & Water Division, Memphis, Tenn.

When load developments prompted the extension of 115 kv to the downtown area of Memphis it was apparent that rights-of-way for overhead circuits of that voltage could not be obtained in that area. Plans were therefore made for the installation of 10 miles of underground cable.

The backlog of work in the construction department prompted us to contract the high-pressure, oil-filled, pipe-type cable installation. Contrary to usual practice the contract was let to a single firm and called for a complete cable circuit in place. Two such contracts were let to separate contractors, each for a complete cable circuit. Although this did not conform to the practice followed on other systems, and several engineers advised against it, good workmanship and an excellent cable system were obtained at a price below the usual cost of such systems. One contract was for a 4.8 mile circuit and the other for two complete circuits totaling 5.2 miles.

Good Job-Low Cost . . . The fact that the best materials, good workmanship, and an excellent cable system have been obtained at a price below the usual cost of such systems, justifies our action. When complete plans and specifications are carefully and accurately prepared, and the work is carefully inspected in detail continuously during its progress, including suitable tests on the work and materials, this is a practicable method of purchasing pipe-type cable systems. This is further illustrated by the fact that the cost of all extra work, including lowering the pipe line because of unforeseen underground obstructions, was less than one percent of the total of the two contract prices.

Type of Cable . . . Detailed investigation of various cable systems for oper-



OIL PRESSURE CONTROL was set up so that with loss of any substation on the cable system, pressure would be maintained and

ation at 115 kv indicated that the most conservative underground cable system for our purpose would be high-pressure, oil-filled, pipe-type, cable system consisting of three single conductor cables installed in a 5⅝ in. Somastic coated pipe, filled with oil at a nominal pressure of 200 psi.

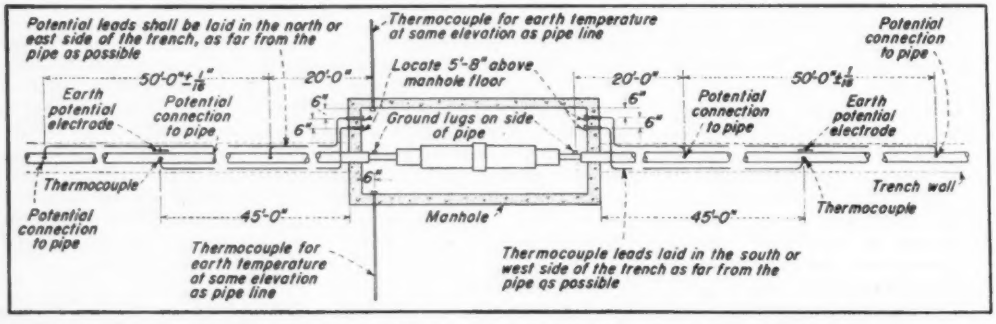
The cable selected had a compact round 500 Mcm, 37 strand copper conductor with metallized paper shielding, 480 mils of mass impregnated paper insulation, shielded with metallized paper and copper tape, over which a ⅛ by ⅝ in. D-shaped bronze skid wire was applied. A temporary lead sheath was used to protect the cable until it was installed. Splices were designed to have an impulse and a 60-cycle strength in excess of the actual impulse and 60-cycle strength of the cable.

Splices and Risers . . . Splice sleeves and all pipe and fittings connected to the splices were welded. Terminals without phenolic material and having a rating of 161 kv were used. Each terminal was installed with a 5-kv heavy duty indoor bus insulator under each of the four corners of its base plate. This permits isolating the pipe line for pipe coating resistance tests and also prevents circulating currents in the copper riser pipes. Tests showed that the circulating current in each riser pipe, with the bases of terminals and the spreader head grounded, was equal to 75% of the current in the cable conductor.

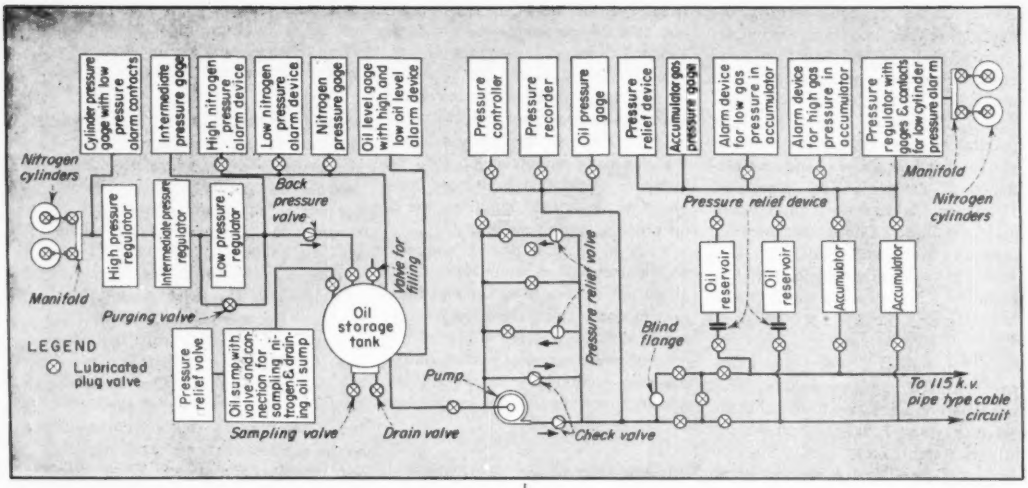
Spreader heads, riser pipes, and terminal base plates were completely installed, welded, and brazed prior to the installation of cable on the second and third circuits. This proved more satisfactory than installing the cable first.

Protect Pipe Line . . . The location, depth, and protection of the pipe lines during future excavation in their vicinity was carefully considered. Pipe lines were routed so there would be minimum chance of having to lower a section of the pipe line due to future grading. For this reason main line railroad grade crossings were carefully avoided. To minimize the cost of pavement removal and replacement, and interference with traffic during construction, pipe lines were installed under sidewalks insofar as practical.

A minimum pipe depth of five feet was selected since this would place the pipe below most water, gas, and sewer services, and thus below most future excavation. Protective concrete


Potential leads shall be laid in the north or east side of the trench, as far from the pipe as possible
Thermocouple for earth temperature at same elevation as pipe line
Potential connection to pipe
50'-0" ± 1/16"
20'-0"
Locate 5'-8" above manhole floor
20'-0"
50'-0" ± 1/16"
Earth potential electrode
Potential connection to pipe
6"
Ground lugs on side of pipe
6"
6"
Potential connection to pipe
Earth potential electrode
Thermocouple
6"
Trench wall
Potential connection to pipe
45'-0"
Manhole
45'-0"
Thermocouple
Thermocouple for earth temperature at same elevation as pipe line
Thermocouple leads laid in the south or west side of the trench as far from the pipe as possible

THERMOCOUPLES were installed parallel to the cable line and at right angles to it at each manhole of circuit run

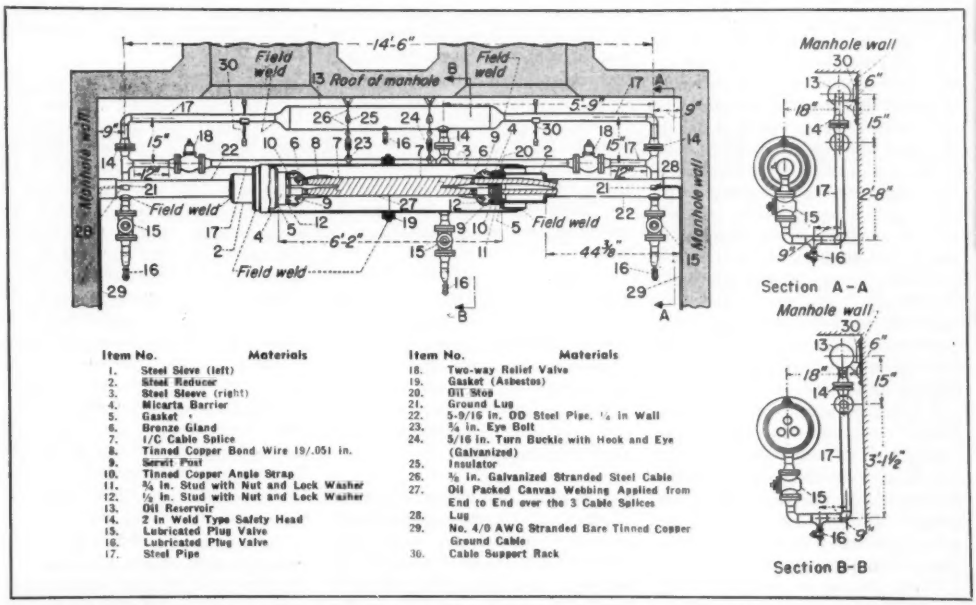


wiring for this control system is shown here. Positive nitrogen gas pressure is maintained over the oil in the storage tank

slabs were not installed over the pipe line because the experience of others indicated that they offered little protection.

Manholes and Spacing . . . A maximum manhole spacing of 2,700 ft was selected for straight pipe line, based on experience of others and recommendations of the cable manufacturers. Due to bends around corners, the actual manhole spacing varied from 1,022 to 2,683 ft with an average of 2,296 ft. This resulted in maximum pulling tensions on the first twelve lengths of 5,650 to 11,450 lb.

All manholes were of reinforced concrete construction and were installed under sidewalks. In order to insure against future difficulties in case of street widening or grading, manhole roof slabs were installed with their top surfaces not less than three feet below the sidewalk surface. Two chimneys with conventional manhole covers were installed on each manhole to facilitate cable installation. Since floor slabs of



Item No.	Materials
1.	Steel Sleve (left)
2.	Steel Reducer
3.	Steel Sleeve (right)
4.	Micarta Barrier
5.	Gasket
6.	Bronze Gland
7.	I/C Cable Splice
8.	Tinned Copper Bond Wire 19/.051 in.
9.	Servit Post
10.	Tinned Copper Angle Strap
11.	¾ in. Stud with Nut and Lock Washer
12.	½ in. Stud with Nut and Lock Washer
13.	Oil Reservoir
14.	2 in Weld Type Safety Head
15.	Lubricated Plug Valve
16.	Lubricated Plug Valve
17.	Steel Pipe

Item No.	Materials
18.	Two-way Relief Valve
19.	Gasket (Asbestos)
20.	Oil Stop
21.	Ground Lug
22.	5-9/16 in. OD Steel Pipe, ¼ in Wall
23.	⅝ in. Eye Bolt
24.	9/16 in. Turn Buckle with Hook and Eye (Galvanized)
25.	Insulator
26.	⅜ in. Galvanized Stranded Steel Cable
27.	Oil Packed Canvas Webbing Applied from End to End over the 3 Cable Splices
28.	Lug
29.	No. 4/0 AWG Stranded Bare Tinned Copper Ground Cable
30.	Cable Support Rack

SEMI-STOP JOINTS were installed in each manhole after decision to install stop joints 2700 ft apart was made by company

a number of manholes were below existing sewers and other manholes were several hundred feet from sewers, sump pumps were installed in each manhole. Three 200-w vapor-proof lighting fixtures were installed in each manhole to provide adequate illumination for installation and maintenance of devices in the manholes. Permanent ladders were installed in each manhole. Interior surfaces of manholes were water-proofed. This facilitated the maintenance of low humidity during cable and splice installation.

Semi-stop Joints . . . Semi-stop joints were installed in each manhole. This was based on a decision to install them not more than 2,700 ft apart which, in this system, meant installation in each manhole. The decision was made after considering the possibility of water or gas crews mistaking the pipe line for water or gas mains and tapping it for a service connection, the possibility of someone digging into the pipe line with a back-hoe or other machine, and the possibility of the pipe or a weld breaking due to expansion and contraction of the pipe line.

Oil Pressure Control . . .Investigation indicated that oil pressure control systems used in the past by others did not meet the requirement that in the event of the loss of any substation on the cable system, oil pressure would be maintained on the entire cable system, so that the substation could be energized through the cable system. It was not practical to provide either an emergency ac or dc standby circuit for a dual pumping plant. Since a dual oil pumping plant would probably be rendered useless in case of a fire either in or adjacent to it, a single oil pumping plant was installed in each substation in which pipe type cable was terminated and each circuit was connected to the pumping plant through suitable valves.

It would be advantageous, if practicable, to operate the entire cable system with all oil pumping plants connected to the cable system and the pipe lines of all circuits connected together. Whether this is practicable will be determined by tests upon completion of the entire system.

If this method of operation is not workable the 4.8 mi circuit will be isolated from the other two circuits and two oil pumping plants will be adjusted to maintain nominal oil pressure on the section and the other will be adjusted to maintain a lower but adequate oil pressure for operation in case of failure of the pumping plant that normally maintains nominal oil pressure. Tests that have been completed prove that the latter method of operation is quite satisfactory.

Each oil pumping plant is complete with alarms and an annunciator to indicate any abnormal condition. Pressure recorder and gauges, devices for maintaining a positive nitrogen gas pressure over the oil in the storage tank, an accumulator to prevent excessive pump operations, and other devices are provided.

Nitrogen Over Oil . . . Nitrogen was selected for the protection of oil in the storage tank because in case of a leak the nitrogen would flow out and prevent the entrance of moisture and air. With vacuum over the oil a leak would result in the entrance of air and moisture which would be very difficult to remove from the oil. It was understood that with nitrogen over the oil, the oil would in time become saturated with nitrogen. This seems to be the lesser of the two evils.

Lubricated plug valves were used throughout the system wherever a ½ in. or larger valve was required. This type of valve was selected because it was recognized that the valves would seldom be operated and that under the corrosive conditions existing, particularly in manholes, any brass valve that is not frequently operated may freeze. Should a plug valve freeze it can easily be broken loose by the proper application of a suitable lubricant.

Joints . . . All joints in oil and gas piping are either welded, brazed, or have flanges with metallic gaskets. The use of couplings was not permitted in any permanent work. This was considered essential in order to reduce maintenance and leaks to a minimum during the life of the system.

Grounding . . . The method of grounding the pipe line and applying cathodic protection received very careful consideration. In order to provide the maximum insurance against electrical shock, the pipe line and all metallic devices connected to it were solidly grounded in each manhole and at every other point where they could be touched by people.

Cathodic Protection . . . Grounding the pipe line so frequently complicated the problem of cathodic protection. Magnesium anodes were considered for use as combination ground electrodes and sacrificial anodes. This idea was abandoned due to inability to obtain any data on the performance of magnesium anodes as ground electrodes. The method adopted was to ground the pipe line in each manhole with two 1 in. by 10 ft Copperweld ground rods—each installed in a diagonally opposite corner of the manhole. The pipe line was also grounded to the substation ground grid at each spreader head and at each oil pressure control set.

Magnesium anodes were installed ten feet below the center of each section of pipe line between manholes and between manholes and terminals. Leads were run from each anode and from the pipe above the anode to a small cast iron box in the sidewalk above the anode at which point they were connected. This will permit periodic tests to determine anode performance. Tests indicate that this method of cathodic protection is quite satisfactory in spite of the many grounds on the pipe line.

Ambient Temperatures . . . Thermocouples were installed on the pipe 45 ft from the outside walls of each manhole for determination of pipe temperature and thus the maximum safe cable carrying capacity at various ambient temperatures. To obtain ambient earth temperatures, thermocouples were installed in the earth 10 ft from the inside side walls of each manhole and at the same elevation as the pipe. Leads from these thermocouples were terminated in the manholes. A heat run was made on each 115-kv cable circuit. While temperature tests are far from complete, difference in pipe and earth temperatures, before and during the heat run, due to the surface over the thermocouples, i.e., grass, concrete, asphalt, etc, have been surprising.

Other design features of the 115-kv pipe type cable system have not been described due to their similarity to other systems described elsewhere.

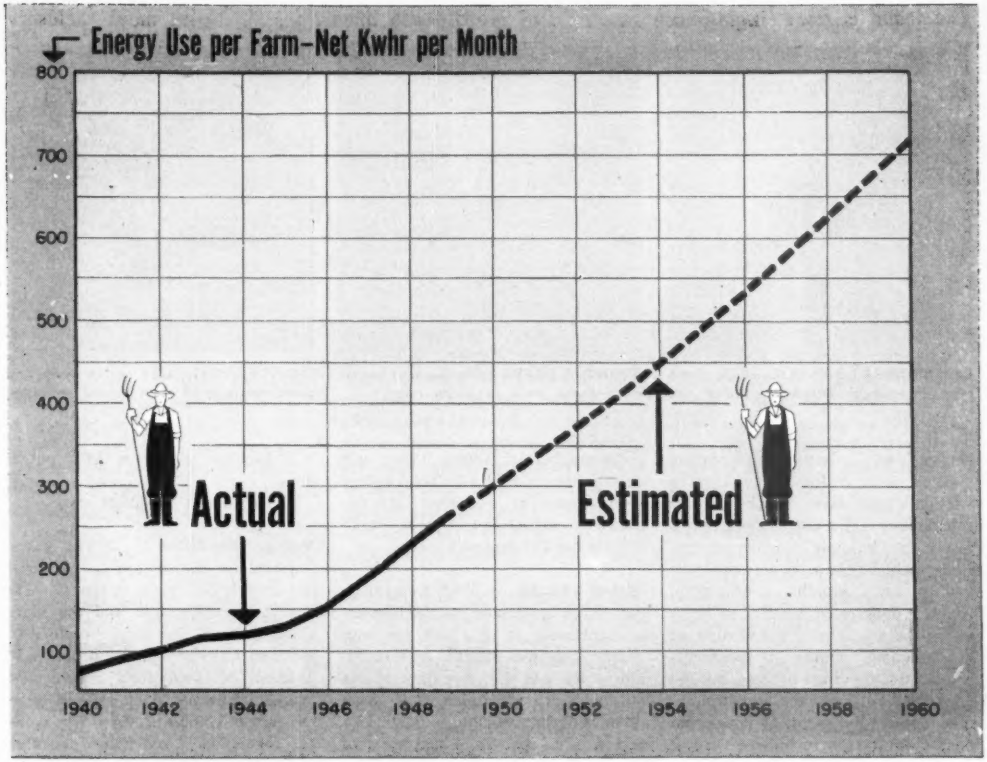


FIG 1—FARM LOADS IN 1960 promise to reach 725 kwhr per month per customer; equivalent to a growth rate of 9.5% compounded annually, according to an analysis of 11 systems. Loads per customer averaged 268 kwhr per month in 1949

Designing Farm Lines For Coming Loads . . .

. . . that may reach 700 kwhr per month per customer by 1960 calls for careful analysis of today's design standards for rural lines. Greater use will also bring demands for greater reliability according to . . .

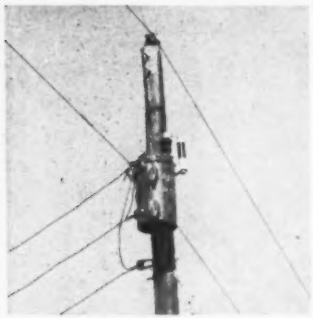
C. M. STANLEY, Engineer
Stanley Engineering Co, Muscatine, Iowa

Design of a rural distribution system, like that of any other system, revolves largely around load predictions. Where will the customers be? What loads will they have?

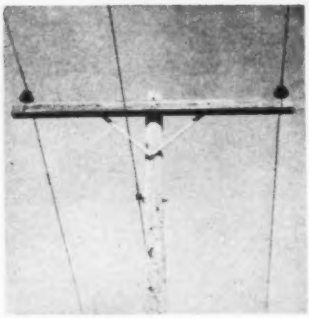
Many midwestern rural systems are approaching the condition where every potential customer has service. Growth in this respect is leveling off. This is not true of electrical energy use by individual consumers. Fig 1 shows average customer use for 11 cooperatives considered in this study, and the predicted use for the next few years. From this it can be seen that there is no leveling off of use.

Future trends are difficult to predict, but for this particular group of 11 cooperatives, it is certainly realistic to expect that by 1960 an average monthly consumption of around 700 kwhr may be realized. The predicted increase from 268 kwhr in 1949 to 725 kwhr in 1960 represents a 270% growth which is equivalent to a 9.5% compounded annual increase whereas the 1940 to 1949 compounded annual increase has been 15.1%. With ever increasing rural uses, such growths are not unreasonable. Whether we agree with these potentialities or not, one fact seems to be a certainty. Loads will continue to grow and will be large as compared with present thinking.

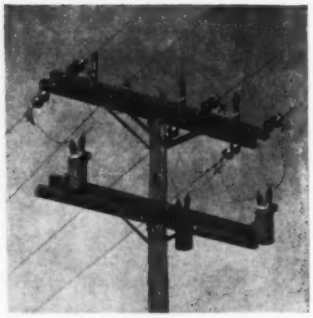
The trend is from single-phase . . . . . to multi-phase lines . . . . . with more reclosers



EARLY RURAL LINES of the single phase type are being rendered obsolete as . . .



GROWING LOADS bring increase use of multi-phase lines in areas where . . .



SERVICE CONTINUITY requirements are prompting use of more circuit reclosers.

Design Load . . . In the design of rural systems, it is customary to select a "design" load upon which to base calculations. The current practice is to use the "ultimate" number of consumers which represents area coverage and to use a monthly consumption which is anticipated about 7 to 10 yr in the future. The determination of the "ultimate" number of consumers is a reasonably direct process, but the determination of the design consumption requires judgment, as it depends upon many factors including: Type of farming, economic conditions, extent of sales promotion, adequacy of electric service, dependability of service, and cost of service.

Evaluating these factors and selecting a "design" load is usually a compromise between optimistic and pessimistic views of probable load growth. It is a matter of judgment, not one of calculation. Currently in the Middlewest "design" loads ranging from a minimum of about 250 kwhr per month per consumer up to 600 kwhr per month are used.

Basic Design . . . With the geographical configuration of a system and "design" load determined, the basic problems of design involve: Division of the area into one or more load centers, each with a substation; and selection of the configuration of lines allowing the desired limitations on voltage regulation and losses.

The "design" load in terms of kwhr per consumer per month is converted into a maximum demand at the substation by the use of a series of charts relating the actual experience on a great number of systems. One such chart is shown on Fig 2. Total energy requirements at substation are obtained by adding to consumer use 15 to 20% for distribution losses.

System Voltage . . . With rare exception, REA systems in the Middlewest are operating at 7.2/12.5 kv wye. This voltage was selected as a standard by REA in the early days of this program. Consideration has been given to higher voltages, usually 22 kv and in some sparsely settled areas of the U. S., these voltages have been used to a very limited extent.

Although there may be merit in considering a higher voltage for new systems, it is not expected that there will be any change in voltage on established systems in the Middlewest within the foreseeable future for the following reasons:

1. Cost of change in voltage would be excessive.

2. Demands for increasing reliability of service tend to limit the area served from the one source of supply.

3. There are no particular advantages of 22 kv over 12.5 kv so far as operation, maintenance, and dependability are concerned.

4. Twenty-two kv is not a sufficiently high voltage to avoid the use of sub-transmission on extended systems. Voltages of 34.5 to 69 kv are widely used for such sub-transmission.

With the expected retention of 12.5 kv, increased capacity to meet future loads will be provided by:

1. Reduction in size of service area and increase in number of substations.

2. Increase in use of multi-phase lines.

3. Increase in conductor size.

Voltage Regulation . . . The usual standard for distribution system voltage drop is 7% between the 12.5-kv bus at the substation and the high voltage side of the most remote distribution transformer. By proper adjustment of distribution transformer taps, consumers can be assured of a satisfactory voltage provided zero voltage regulation is maintained on the 12.5-kv bus at the substation.

Voltage regulators at the substation to adjust for variations in supply voltage are becoming standard practice. Our practice is to use multi-phase step regulators with 10% buck and boost and to adjust for zero regulation on the 12.5-kv bus. As loads approach those for which the system is designed, the use of line-drop compensation will undoubtedly be justified.

Limiting regulation on the primary lines to 7% requires the adoption of a line configuration, selection of suitable conductor size, and proper amount of multi-phase construction to obtain the desired regulation with the design load on the system.

Distribution voltage regulators are usually a stop gap or expediency. One exception is their use on exceptionally long feeders that cannot be served economically from another source of supply.

Line Design . . . With the voltage set at 7.2/12.5 kv, with "design" load selected, and with voltage regulation limitations defined, the design of lines

involves the determination of the load area, the location and sizing of substation, and the arrangement of lines. Our experience has indicated that service areas should be such that the most remote consumer is not more than 25 miles from the substation. Load areas tend to be rectangular in shape and substations will be spaced 15 to 25 miles apart. While substations are frequently shifted slightly from load centers to suit existing transmission lines or to fit existing multi-phase distribution lines, the tendency is increasingly in the direction of locating them where they belong with respect to the load area.

Transformer capacities in substations usually range from 750 to 2,000 kva with the great majority being 1,000 or 1,500 kva. Only rarely are 450 or 600-kva installations selected. The use of single-phase transformers in substations is almost universal.

Multi-phase lines radiating from the substation may be either three-phase and neutral, or "V"-phase, that is, two phases and neutral. A tabulation of recent recommendations on 11 systems shows a percentage of multi-phase lines ranging from 11.6% to 16.6% of the total line mileage with a definite trend toward a higher value.

The trend toward greater use of multi-phase lines will increase with growth of load to provide more satisfactory voltage regulation and also to care for increasing demands for three-phase service.

Off Peak Control . . . To date, system design neglects the future use of off-peak controls to limit the use of certain appliances and equipment on the farm. The need for such off-peak control equipment which can be satisfactorily applied to extensive systems is great. The economics favor the use of such controls so strongly that as soon as it is commercially acceptable it should find wide use. Such control will improve load factor by reducing peak demands and thus allow a given system to handle a greater monthly use.

Conductor . . . Conductor sizes are selected both from the voltage regulation and power loss standpoint. There are cases, based upon power loss economics, where the size of conductors may be increased above that required to limit voltage regulation. In general, if the voltage regulation of three-phase lines is held to about 0.3% per mi and that of "V" and single phase lines to 0.4% per mi, there is no need for an economic study.

Transformers . . . On original construction in the late thirties, perhaps 80% of the distribution transformers were rated at 1½ kva, with the balance at 3 kva except for a limited number of 5-kva units. Now most cooperatives are purchasing 3-kva transformers and the demand for installing 5-kva or larger transformers is increasing.

The selection between conventional and completely self-protected units continues to vary with the particular preferences and experiences on a given system. However, the completely self-protected transformers are increasingly more popular. The predominant voltage rating is 7,200 to 120/240 v with four 2½% taps below normal in the high voltage winding.

Sectionalizing . . . Continuity of service has been the largest single factor in influencing the trend toward oil circuit reclosers for sectionalizing. Sectionalizing procedures vary. Following are a few criteria which seem to be reasonably well accepted:

1. Sectionalizing devices are spaced 5 to 10 mi apart on lines.

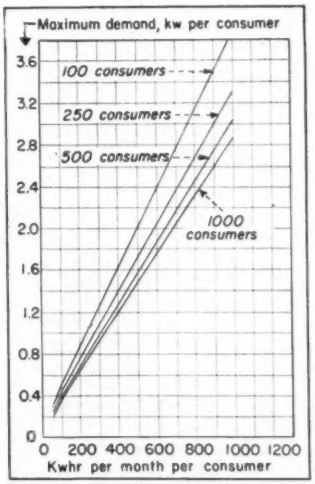


FIG 2—RURAL SUBSTATION DEMAND can be determined from charts like this one that relate actual experience on a large number of rural distribution systems

2. Single shot fuses and sectionalizers are used in conjunction with reclosers on single-phase lines. The fuses are selected so that the protected recloser operates to remove temporary faults, but the fuse will clear permanent faults before the recloser operates to lockout. The sectionalizer operates in step with but reaches lockout before the protected recloser. The sectionalizer is not capable of interrupting fault current but is oil filled and may be used as a load break switch if desired.

3. Reclosers are commonly set for two fast and two retarded operations. Variations to this arrangement include one fast and three retarded operations or four retarded operations.

4. Single phase taps on multi-phase lines have sectionalizing devices installed if their line length exceeds four or five miles.

Dependability of Service . . . Perhaps the most marked trend of rural distribution systems is the necessity of providing greater reliability and dependability of service. The increasing use of electrical brooders, refrigeration, and other services means that substantial loss can result with an outage of any duration. A few steps which will improve the reliability of service on rural systems are:

1. Limitation of service areas.

2. Use of the tie lines between service areas.

3. Two-way service on transmission lines to distribution substations.

4. Availability of spare transformers for distribution substations.

5. Proper sectionalizing of lines to limit area of interruption.

6. Adequate preventive maintenance on systems with particular regard to tree trimming.

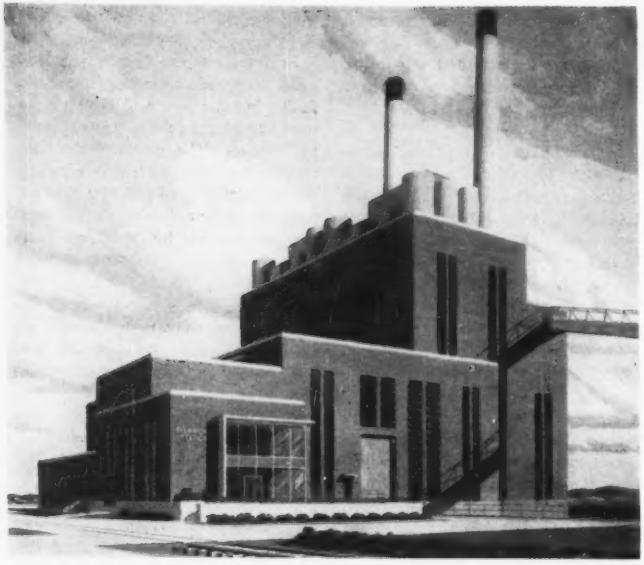
7. More rapid restoration of service following interruptions through the use of better servicing equipment including the use of radio dispatching.

8. Availability of mobile units.

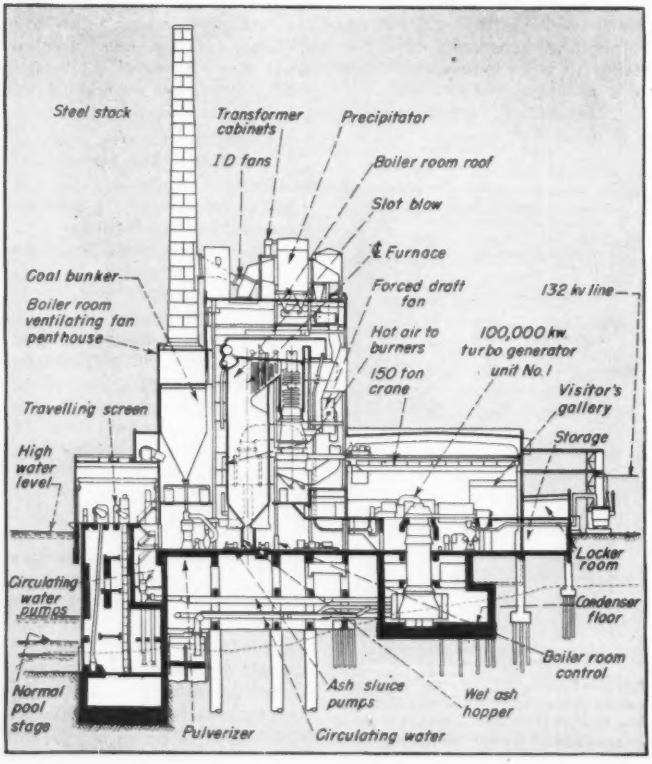
Conclusion . . . The design of rural electric systems has become more definite as the size and extent of systems have been stabilized and as the trends of load growth have been more clearly indicated. Future designs must take into account the expectancy of substantially higher consumption and must provide greater continuity and reliability of service.

5% Saving

B. J. JEAGER
Supt, Walter C. Beckjord Plant
The Cincinnati Gas & Electric Co



COMPACT VERTICAL ARRANGEMENT was prompted by river conditions and foundation requirements to meet them. Ultimate rated capacity to be 750,000 kw



DIFFERENCES IN WATER LEVEL and costly foundation prompted compact vertical design of new steam station

Rapid growth of system load of the Cincinnati Gas & Electric Co required an appreciable increase in generating capacity. Development of existing stations was such as to require development of a new station site. West End Station is located in the heart of Cincinnati on the Ohio River while Miami Fort Station is on the Ohio and 20 mi downstream from the heart of the city. Cooling water consideration plus the desirability of a major power supply on the other side of the city prompted the selection of a site for the new Walter J. Beckjord plant on the Ohio River. The location of the new plant will be approximately 18 mi upstream from the heart of the downtown section of Cincinnati.

Features of the new station include: Use of the reheat cycle, first of this type installed on the Cincinnati system since the Miami Fort installation in 1925; elimination of steam operated auxiliaries; low make up by demineralized well water; and no railroad connection to the plant.

The Walter J. Beckjord plant is designed for an ultimate rated capacity of approximately 750,000 kw in six units. The first and second units are rated at 100,000 kw, the third unit at 125,000 kw and it is assumed that No 4 will be the same capacity. The plant is designed for 9,600 Btu per kwhr for Unit No 1; 9,500 Btu per kwhr for No 2; and No 3 will be approximately 9,400 Btu per kwhr.

The reheat cycle was selected for this installation because it offered an improvement of approximately 5% in efficiency as compared to the next best unit on the system, which was a 1,250 psi, 950F design, without using steam temperatures in excess of 1,000F. The economic study for this installation indicated that, with the high cost of fuel and the probability of its increasing,

Turns Cincinnati To Reheat Cycle

Walter C. Beckjord Plant has no steam operated auxiliaries, low make up is supplied by demineralized well water, and there is no railroad connection to the plant

an installation with lower efficiency than the reheat unit would give could not be considered. The actual design at the turbine is 1,450 psia, 1,000F; 450 psia, 713.5F high pressure exhaust at maximum capability; 400 psia, 1,000F return to the intermediate section with an integral cross-over connection to the low pressure section.

Reheat System . . . Reheat is accomplished with two sections of pendant type superheater immediately behind the secondary section of primary steam superheater. Control of temperature of reheat steam is accomplished automatically by burner tilt with automatic secondary backup control by desuperheater and an emergency hand control desuperheater valve for unusual conditions. Control of temperature of primary steam is accomplished by both automatic and emergency hand operated desuperheater.

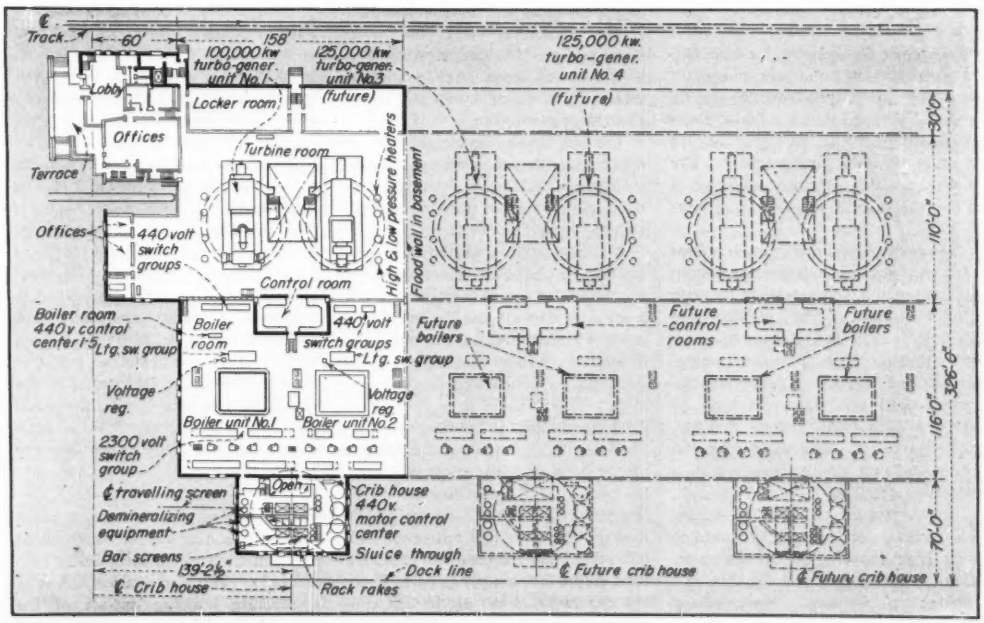
A motor-operated, stop-gate valve is installed in the primary steam outlet in order to meet the Ohio State Code. Hand operated stop-gate valves are installed locked open in the reheater inlet in order to facilitate hydrostatic testing of the reheater element.

Safety valves of 25% capacity are installed with the boiler equipment at reheater outlet and 75% capacity valves with the piping at reheater inlet. The superheater and reheater tubing is extended horizontally to an outlet header connection in order to provide sufficient flexibility for 100% of the vertical expansion in primary, reheater inlet, and reheater outlet piping to the turbine.

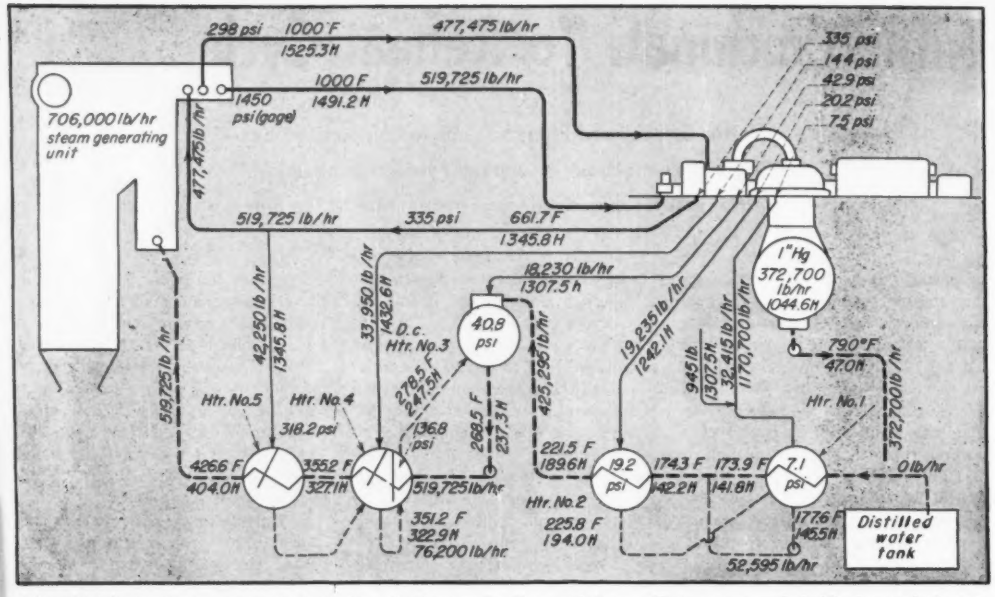
Provision has been made for both pulverized coal and future oil burning. Initially only oil ignition and starting up, light-oil burners will be installed. The ignition oil burners include thermocouples in the burner horn to indicate and give an alarm in the central control room for proper ignition flame.

A television set is provided in the control room to give a direct view of boiler drum water level.

Regenerative type air preheaters are installed, two per boiler, with provision for recirculation of air to control corrosion during part load operation with high sulphur coal. The exit gas temperature is guaranteed to be not greater than 275F at 700,000 lb per hr boiler rating. The elements are all basketed to reduce construction cost and facilitate cleaning and replace-



CONTROL ROOM for first two units will be centrally located between boilers and turbines. Plans call for ultimate of six units



GAIN OF 5% in efficiency prompted selection of reheat cycle. Unit with lower efficiency was undesirable due to fuel costs

ment. There are two combination damper and Nane-controlled forced draft fans and two variable-speed, combination damper and magnetic coupling controlled induced draft fans for this boiler.

Condensing Equipment . . . Condensers have divided water box with motor operated valves operated from control room to accomplish normal flow, backwash on alternate quarters and ice melting at intake during winter. The control for these various conditions is on a single multi-contact, drum-type switch.

Mechanical type dry vacuum pumps are used for this installation, one pump per unit with a common spare for each pair of units. The motor-driven vacuum pumps were chosen in order to eliminate high pressure piping, valves, and associated equipment required with the steam jet type of vacuum equipment, reduce makeup, and also to take care of starting the boiler and unit simultaneously with a minimum of 50 psi.

The motor-driven vacuum pumps are excellent for "hogging" because of their high capacity at low vacuums. There is no jet retained for this unit for backup purposes. No auxiliary steam driven equipment is planned.

The intake crib, located out in the river, is a cylinder sunk through a sand island in approximately 20-ft section pours. It includes trash rakes, stationary grill, traveling bar screen, and a traveling screen in series ahead of the circulating water and service water pumps. The design provides for a variation in water level of approximately 75 ft which is required at this Ohio river location.

The crib house also includes service water clarifying equipment, the demineralized well water treating equipment for feed water makeup, and circulating water chlorinators.

Another well, sunk by the same method, is installed downstream to accommodate the river barge coal unloading equipment and the equipment crane which is necessary at this location due to the fact that it has no outside railroad connection.

Coal Handling . . . The barge unloading crane has an eight-ton bucket and on the basis of a 48-sec cycle is rated to handle 600 tons per hr. Two crushers each with a capacity of 400 tons per hr and a 600 ton per hr belt serve the boiler bunkers with provision for a future 600 ton per hr belt. There are also two 600 ton per hr belt conveyors to handle respectively storeout and re-claim coal. Storeout and re-claim service at the end of the belt will be handled by bulldozer and Carry-all mobile equipment. Provision has been made initially for 105,000 tons of storage coal about half of which is flood proofed.

Feed Water System . . . Two low-pressure, a deaerator, and two high-pressure closed heaters are included in the re-generative cycle.

Boiler feed pumps are variable speed through a hydraulic coupling controlled by a three-element type of control. Three boiler feed pumps are installed, two of which are required for maximum capability. No feed water regulating valve is included. However, a motor operated globe valve has been installed on the by-pass around the No 4 heater so that artificial resistance can be inserted in the system to facilitate variable speed pump control during low pressure operation when bringing the unit and boiler into service.

Control Room . . .The control room inside the station consists entirely of an isolated room for mechanical control only. The electrical control is in a separate building outside of the main plant. The mechanical control

room is located between the boiler and turbine rooms at turbine room operating floor level with access from both boiler and turbine room sides. Both boiler and turbine rooms can be seen from the control room through the large glass access doors. The control room is large enough for two units. It is contemplated that two operators will control the first unit with possibly a 3rd operator for two units.

The unit boards are divided into eight sections as follows: Turbine, hydrogen, circulating water, feedwater, air and flue gas, master, fuel, and superheat-reheat. The service and soot blower boards serve two units.

Electrical Connections . . . The first generator has a capability of 100,000 kw. It is rated 13,800-v, and is directly connected to three single-phase, 33,333-kw transformers which step up to 132,000 v. Connection from the generator to the transformers is made with metal enclosed, isolated-phase bus. Such a bus has the advantage of being located above ground where it is readily accessible for inspection. Furthermore, its components are metal and porcelain, both of which can be subjected to heat due to overloading without suffering any appreciable damage.

Main power transformers are of the water-cooled, forced-oil type, Class FOW. Consideration was given to the use of a 3-phase transformer, but since a spare single-phase transformer was already available from the Miami Fort Station, it was decided to use single phase transformers. The transformers are connected delta-wye with the high voltage neutral solidly grounded. The high voltage winding has graded insulation.

Main connections in the 132-kv switchyard have been kept relatively simple. There are two main buses but no transfer bus. The transmission lines connect to one or the other of the two buses, but not to both. The generators will have two oil circuit breakers, thus making it possible to connect to either or both of the buses.

A reserve auxiliary transformer is connected to one of the 132-kv buses through a disconnecting switch. No circuit breaker is provided on the high tension side. Consequently, relaying is such that if a fault develops in the transformer, one of the two main buses must be disconnected from service. This is not considered to be a serious hazard since modern transformers have proven to be very reliable. Saving in investment due to the elimination of this circuit breaker is appreciable.

Auxiliary Power Supply . . . Principal voltages used for auxiliary power service are 440 v and 2,300 v, plus the usual 110/220 v required for the less important fractional horsepower motors.

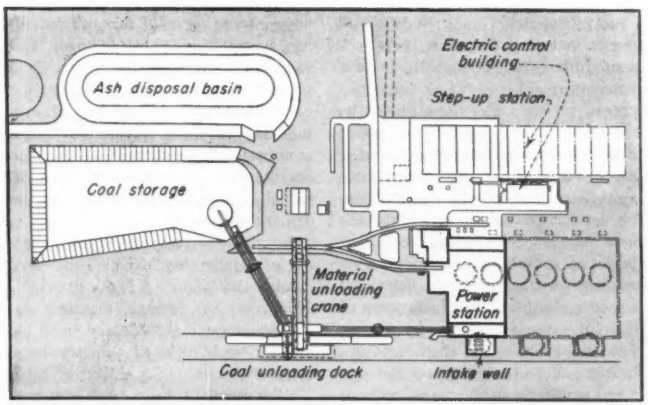
The two reserve auxiliary transformers supply power for starting up the station and are used as the reserve for the unit auxiliary power. The unit auxiliary transformer is directly connected to the generator leads through a disconnect switch and is included in the generator differential protection scheme. One of the reserve transformers is excited continuously.

Generator Excitation . . . The main exciter is directly connected to the generator and is of the stabilized type, rated at 375 v. The rotating amplifier type of pilot exciter is installed on the extension of the exciter shaft. This scheme of excitation was chosen because it was believed to provide greater reliability, inasmuch as the voltage regulator is of the static type, eliminating all moving parts. Further, a short circuit or an open circuit in the exciter regulating equipment would not necessarily shut down the unit as basic excitation is provided by the direct-connected exciter.

Cable & Conduit System . . . Increasing cost of construction trade labor at the job site has made it more and more desirable to use prefabricated equipment as much as possible. To reduce the cost of installing conduit with its numerous bends and fittings, cable pans will be provided for all main runs. These pans are made of No 12 gauge sheet steel and are 9 in. high and from 2 ft to 4 ft wide, depending upon the number of cables to be carried. The cable pans interconnect main control boards in the centralized control room, 440-v substations and control centers, and any other piece of equipment requiring connection to numerous cables.

Multi-conductor control cables used for 2,300-v and 440-v auxiliary service have ozone resistant-oil base compound insulation with a color-coded Neoprene jacket over the insulation. The multi-conductor power cables consist of three single conductor cables twisted together in the factory and shipped as an assembly, but no separate jacket is provided over the assembly.

Engineering . . . Sargent & Lundy are the consulting engineers on the power station. Great credit is due them for their contributions toward the engineering developments of the station and for their very close coordination and cooperation with the operating and engineering personnel of the Cincinnati Gas & Electric Co.



NO RAILROAD IS AVAILABLE at Walter C. Beckjord and barge unloading is provided for heavy equipment as well as coal. Design calls for compact vertical arrangement with ultimate of six units. Plant is located 18-mi upstream from Cincinnati. Coal storage area holds about 105,000 tons, half of which is flood-proofed

Let's Standardize Demand Metering

AGREEMENT ON

1. **One time interval**
2. **Minimum number of scale classes**
3. **Less variation in scale markings**

Standardization of demand metering equipment for commercial and small industrial loads will provide benefits for both power companies and meter manufacturers

W. M. HOWE, Meter and Instrument Dept
General Electric Co, West Lynn, Mass.

Benefits that lie in the wake of standardization of demand metering equipment should not be underestimated. Some of the more important benefits are: Reduced inventories for both utility and manufacturers, shorter delivery time, increased flexibility in use of equipment, more accurate and reliable equipment, reduced first cost, and reduced maintenance cost. Today these factors are of such vital importance to the utility as to warrant serious consideration of the subject of demand metering standardization and simplification.

On what basis will standardization be most effective? It can be brought about internally by utilities acting independently or it can be done on an industry-wide basis. Individual utilities may strive for standardization within their own organization and reduce very materially the number of devices used, but little if anything will be accomplished overall. Such standardizations tend to make the general industry scene worse instead of better.

To be most effective for both utility and manufacturer, standarization must be practiced on the basis of "industry standardization." Translating this into practical terms, it means that we must decide upon a minimum number of requirements for demand metering equipment and that these requirements must be generally accepted throughout the industry. As a basis for determining these minimum requirements, let us look at the situation in energy metering and demand metering and see where we can best direct our efforts.

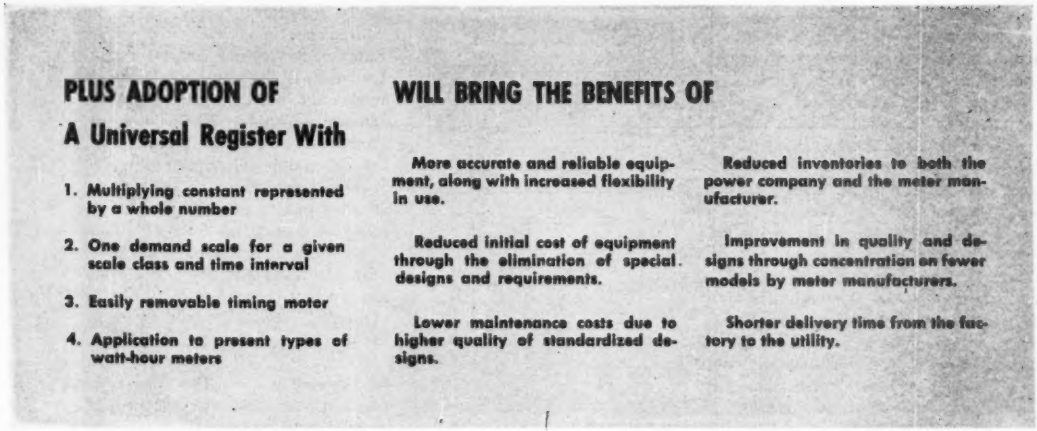
Energy Metering . . . In the field of energy metering, the art is fairly well standardized. Self-contained watthour meters have either direct reading registers, or registers that are adjusted by a multiple of ten. Watthour meters used with instrument transformers fall into two systems: (1) Secondary reading register method—This method has the advantage of always using the same register on a given meter and requiring only that the multiplying constant be changed when the meter is used on instrument transformers of different ratings; (2) Primary-reading register method—This method is not flexible. A meter equipped for primary reading can be used without change only with a set of instrument transformers having the combined ratio for which the register was designed. Thus it is apparent that, while additional progress could be made, the situation in the metering of energy is relatively good.

Demand Metering . . . The situation in demand metering, by comparison, is not good. This is due in part to the complexity of demand metering. But the situation is not hopeless and considerable improvement can be made.

One bright spot in demand metering is the high degree of standardization existing in the demand metering of industrial loads, where curve-drawing and printing types of demand recording meters are used. Almost universally the demand meters of a given type are all identical. Multiplying constants, either the product of current and potential transformer ratios or appropriate constants obtained from operating characteristics of the individual equipment, are applied to the demand meters.

But the situation in demand metering of smaller loads, which are very much in the majority, is not so bright. This class of demand metering includes commercial loads and small industrial loads metered with watthour demand meters of the indicating type.

With our field thus narrowed down, let us examine the factors which enter into standardization of demand-metering equipment. Little can be done


PLUS ADOPTION OF
A Universal Register With
1. Multiplying constant represented by a whole number
2. One demand scale for a given scale class and time interval
3. Easily removable timing motor
4. Application to present types of watt-hour meters
WILL BRING THE BENEFITS OF
More accurate and reliable equipment, along with increased flexibility in use.
Reduced initial cost of equipment through the elimination of special designs and requirements.
Lower maintenance costs due to higher quality of standardized designs.
Reduced inventories to both the power company and the meter manufacturer.
Improvement in quality and designs through concentration on fewer models by meter manufacturers.
Shorter delivery time from the factory to the utility.

about voltage and frequency, although in the case of frequency the trend is definitely toward the elimination of all except 60 cps.

Time Interval . . . A factor which can well be considered for standardization is the time interval. There are at least four different time intervals in use in this country—5, 15, 30, and 60 min—although 15-min and 30-min intervals are used in at least 95% of the cases. The fact that these two time intervals seem to fit equally well into rate structures in common use would indicate that their respective operating characteristics do not differ enough to preclude the possibility of standardizing on one or the other.

These comments on time intervals apply equally to time intervals used in all types of demand metering. In the case of large industrial demand meters and watthour demand meters with demand registers, the matter of time interval, as it affects meter design, is relatively simple. Time intervals are built into the devices by changing the ratio of gear tr ns in the mechanisms. In the case of thermal meters, however, the time interval is a fundamental characteristic of the mechanism and has to be built into the basic design. It deals with such principles as heat storage, heat escape, and heat transfer. Indications of the thermal demand meter are not so precise and cannot be directly compared to those of the so-called block-interval meters which indicate average power over specified intervals. This difference is recognized by the industry.

While both 15-min and 30-min time intervals are used, the vast majority of thermal meters are of the 15-min type. In some cases, moreover, the 15-min devices are used where the block-interval devices are of the 30-min type. In the interest of standardization it would be extremely desirable to have a single time interval.

Demand-Scale Capacity . . . The matter of demand scale capacity does not apply to demand meters for large industrial loads inasmuch as these devices are usually of the printing and recording types. These almost universally have fixed demand mechanisms and use arbitrary scales or printing to which appropriate multipliers are applied.

This fairly standardized situation does not exist with watthour demand meters equipped with demand registers. Over the years, in an effort to obtain the maximum degree of accuracy for all ratings of meters, a large number of scale ranges and classes have been produced. These completely blanketed the range of demands. Considering all types of registers manufactured, there were at least seven different classes of scales varying in full-scale capacity from 125% to 480% of the nominal rating of the corresponding watthour meter. Other classes were 150%, 208%, 250%, 300% and 333⅓%.

Obviously, there was considerable overlapping of scale ranges. From a practical standpoint the slight increase in reading accuracy did not justify the large number of scales that were manufactured. It is apparent that this situation has been recognized. A few years ago the "specification for Indicating and Cumulative Register Scales" of the Association of Edison Illuminating Companies and the Edison Electric Institute reduced the number of scales to two: 166⅔% and 333⅓% of nominal rating. This selection has provide generally to be satisfactory.

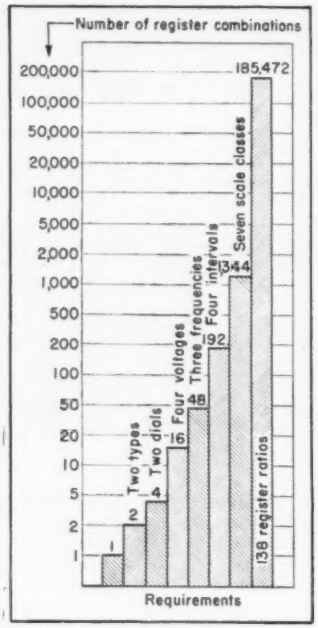
In addition to the class of demand scale, there is the matter of actual scale markings, depending on the rating of the watthour meter. This involves a multitude of scales. This situation warrants consideration. As in the case of printing and recording demand meters, an arbitrary or universal scale could be adopted. Perhaps, if this degree of standardization is too radical, some compromise could be worked out to reduce the different scales to those for self-contained meters and to secondary scales for transformer-rated meters.

Thermal demand meters, not having been so generally used, although comparable to demand registers, are more definitely standardized by the "Specification for Indicating Thermal Watt Demand Meters" of the Association of Edison Illuminating Companies and the Edison Electric Institute. In general, the above comments apply to scale classes for thermal meters.

Kilowatthour Registers . . . By far the largest field for improvement is in

standardization of kilowatthour register and demand scale of watt-hour demand meters, both of demand-register and thermal types. With demand registers, a vast number of register ratios are in general use. On self-contained meters there are about 15 different register ratios. In addition there are a very large number of register ratios used with meters with instrument transformers. As a result, it is possible to count at least 125 register ratios and demand scales that are more or less standard. That there are literally thousands of different ratings of demand registers is no exaggeration. The combination of the different voltages, intervals, scale classes, register ratios, etc, results in almost 200,000 different ratings. All that has been said above relative to register ratios of demand registers applies to combination thermal demand meters, although perhaps to a somewhat lesser degree.

Universal Register . . . The optimum in standardization would be the adoption of a single register ratio and demand scale for all ratings—a "universal" register. This register, which is provided for in the "Specification for Demand Register Scales" and is now being used by many utilities, has these requirements: (1) A single register ratio so chosen that the multiplying constant for the watthour dials and the demand scale as well, in nearly all cases, will be a whole number; (2) for a given scale class and time interval, a single demand scale to which an appropriate multiplying constant can be applied regardless of the rating of the watthour meter to which the register is attached; (3) an easily removable timing motor for convenience in changing the voltage rating of the register; and (4) a register which is applicable to all current models of watthour meters of the same manufacture. While use of the "universal" register will involve the use of multiplying constants on all registers, benefits to be derived are so great that its adoption should certainly be considered. Such a practice is in line with that used in metering industrial loads with graphic or printing types of demand meters. Use of "universal" registers would eliminate the necessity of using 5-dial registers.



LACK OF STANDARDIZATION in the field of demand metering could skyrocket the possible number of combinations of demand registers to almost 200,000

In Conclusion . . . The benefits of standardization and simplification of demand-metering equipment to the industry are many. The number of different devices will be greatly reduced as will the number of supply parts to be carried in stock. Maximum flexibility will also be obtained. If the manufacturers can reduce the number of different ratings of devices built, their stock situations will be greatly simplified and shipments to customers will be expedited. If the manufacturers can concentrate their efforts on fewer combinations, there will be a great improvement in designs and quality. There is no question but that lack of standardization results in higher first cost and lower quality with resultant higher cost of maintenance because the manufacturers must build compromise designs.

Ladder Storage Rack Saves Space and Time

J. A. RICHMAN
Mechanical Maintenance Supervisor
Virginia Electric and Power Co
Richmond, Va.

STORAGE RACK holds 21 extension or straight ladders. It saves space and is easily dismantled. One man can place or remove any ladder without disturbing others

A space saving, compact, and portable storage rack for 21 ladders enables one man to easily place or remove any ladder without disturbing the others in storage. It is mounted on swivel casters so that it can be moved to almost any position on a level floor. It can be readily dismantled if necessary and moved to another floor or location.

The design is such that when aluminum is again available, this rack could be made from aluminum structural shapes at a great reduction in weight and still be sufficiently strong.

DISPATCHING CENTER has visual tasks involving both the vertical and horizontal planes. Here provision is made for an average vertical illumination of 20 ft-c (calculated) on the upper third of board. Matte finish reduces reflected glare

Lighting Modern Plant Control Centers

Trend to centralization of controls and instruments brings more critical seeing tasks. Here the author outlines engineering fundamentals and illumination problems encountered in control rooms, dispatching centers, and system analyzer rooms

V. L. DZWONCZYK, Operating Sponsor
American Gas & Electric Service Corp, New York, N. Y.

Proper lighting for control center areas grows in importance as they become more extensive in scope and come under the control of a smaller and smaller number of operators.

Too often visual tasks in the control rooms are not the only criterion that dictate the type of lighting which is used. Other objectives frequently govern the selection of a lighting system, such as the desire for it to be a public show place, a need to dramatize the nerve center for its advertising value, or simply to try the latest ideas in lighting. Search for the most reasonable solution, however, suggests a review of the fundamental requirements affecting the problem, and a determination of how best to utilize the many available new light sources to effect the desired result.

Cost of lighting is often overlooked on the premise that the portion spent for this item of power plant is very small. Such an attitude seems unreasonable for should all small contributions be so treated, the total would not represent the most economical solution nor would it necessarily be the most efficient. That is not to say, however, that the more expensive system is not justified sometimes by a combination of reasons in addition to good lighting, such as advertising appeal, betterment of public or personnel relations, and even perhaps research.

The particular nature of the control room lighting problem also exists in other areas such as dispatching centers and system analyzer or calculating rooms. These areas may be considered alike from the lighting standpoint with only slight modification of detail.

Surfaces to be Illuminated . . . In analyzing the lighting problems of control, dispatching, and system analyzer rooms, the requirements are more exacting than in most general lighting projects. For example, illumina-

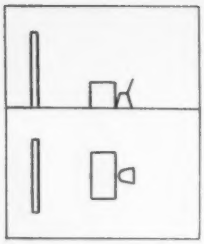


Fig 1

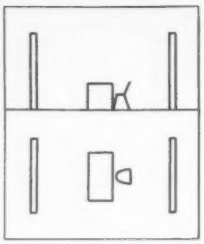


Fig 2

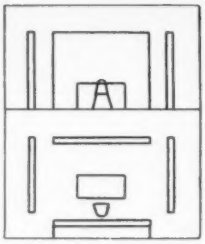


Fig 3

TYPICAL ARRANGEMENTS of control boards and furniture are shown for: Control rooms (Fig 1 to 6) such as power plant switchboard rooms, substation control rooms, and boiler rooms; centralized control rooms (Fig 7 and 8) for one and two boiler-turbogenerator units; and console-type control rooms (Fig 9) with benches and boards having considerable control devices and miniature instruments. Both elevation and plan views are presented

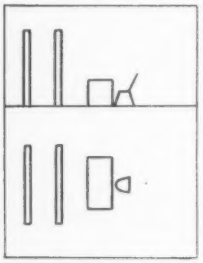


Fig 4

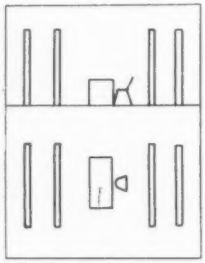


Fig 5

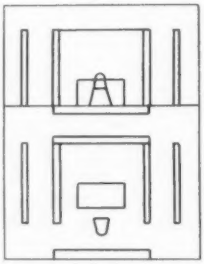


Fig 6

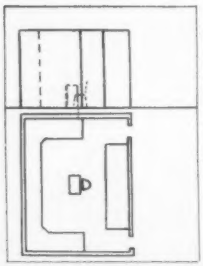


Fig 7

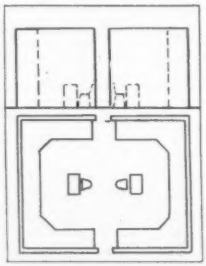


Fig 8

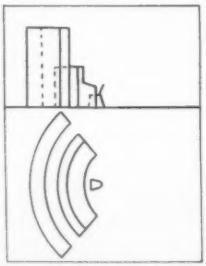


Fig 9

SYSTEM ANALYZER ROOM has board mounting representative system elements and light-indicating instruments. Here both the vertical and horizontal planes prescribe critical seeing tasks. Average vertical illumination is 50 ft-c on upper third of board

tion on the horizontal plane is secondary in importance to that on the vertical plane. The more important surfaces to be illuminated are listed in Table 1 along with suggested illumination levels on the respective surfaces.

Visual Tasks . . . The tasks involved in various types of rooms are discussed in following paragraphs.

Conventional Control Rooms. This classification includes control and instrument centers such as the conventional power plant switchboard rooms, substation control rooms, and isolated boards for boiler and electrical auxiliary control.

Here the seeing task centers on the many glass-faced instruments which virtually cover the entire upper two-thirds of the board surface. From a position adjacent to the board, approximately an arm's length away, the control operator should be able to observe clearly the indicated readings of instruments. Similarly from any control position the operator should be able to see the position of the pointer in relation to the scale extremities of the furthest instrument. It is also important that the indicator lights on the board be clearly distinguishable.

A secondary visual task exists on the horizontal plane of the operator's desk. The work usually involves discrimination of moderately fine detail and is performed at intermittent periods of time.

Benchboards present a problem of their own especially if the horizontal surface is also provided with instru-

ments in addition to indicating lights and control devices. The operator may need a close vantage point to read the instruments but the avoidance of reflection, shadows, and glare is paramount.

Centralized Control Rooms. Some centers function to control one turbogenerator, its boiler or boilers, and accessories; others are for two identical units.

These types of control centers merely amplify the problem by assembling many more and often smaller instruments on the control board. Size of the room may also increase the distance of sight under certain operating conditions. This kind of control room usually has a centrally located desk from which a chief operator must view without visual discomfort, the entire control board panorama. The control operator can read the instruments from closer positions as required.

In a centralized control room the horizontal surface of the operator's desk and the benchboard if used have visual tasks similar to those described under conventional rooms.

Console-type Control Rooms. The ultimate in centralization may involve a console with pushbutton control elements on a horizontal plane and miniature indicating and recording instruments on a vertical plane. The console takes the form of a miniature benchboard, arranged as a centralized cubicle-type board. Proximity of the operator to the instrument and control devices enhances his ability to see the respective elements. The smallness of the instrument however increases the visual task.

Dispatching Centers. A central dispatching point may be an office centrally located system-wise. Secondary dispatching centers, in general, are responsible for assembling load data from the lower voltage control points, and instructing local operators how their system shall be operated for maximum system economy.

In the central and secondary dispatching centers the visual tasks involve both the vertical and horizontal planes. In the central dispatching office the occupants may be more concerned with calculations at an office desk, reading and tabulating load data, and preparing reports. An appreciable amount of use would also be made of the telemetering instruments and the system maps on the vertical plane of reference.

In the secondary dispatching centers more reference would be made to the system switching diagram, the system map, and the telemetering instruments on the vertical plane than in the central dispatching center but the visual task would still not be so severe as in a control room. The visual task on the horizontal plane may be just as severe as in the central dispatching office especially if the dispatcher is called upon to tabulate system load data received by phone from other control centers.

System Analyzer Rooms. The system analyzer room may be considered to have a composite visual task combining those of a centralized control room and a central dispatching office. The nature of the work in this room at times involves a critical seeing task on the vertical plane and at other times an equally critical task on the horizontal plane. Therefore, the system of lighting must be flexible enough to provide for these situations.

TABLE I —ILLUMINATION OF SURFACES IN CONTROL CENTERS

Objects to be lighted	Type Surface	Minimum ft — c		
		Suggested	I.E.S.	Inches*
Control Boards				
Conventional	Vertical	20	30	66
Centralized	Vertical	20	50	66
Console	Vertical	40		48
	Horizontal	20		30
Bench Boards	Vertical	20		66
	Horizontal	20	30	30
Desks				
Operators	Horizontal	20	30	30
Dispatchers	Horizontal	30	50	30
Calculating	Horizontal	50		30
System Map	Vertical	20	50	48
Switching Diagram	Vertical	20	50	48
Inside Switchboard Cubicles	Vertical	10		66
	Horizontal	5	5	0
Analyzer Board				
Control Table	Horizontal	20		30
Galvanometer	Vertical	10		48
Board Elements	Vertical	30		66
Work Table	Horizontal	50		30

* Above floor

Illumination Fundamentals . . . From the illumination engineer's standpoint, the following major fundamentals must be observed to effect a reasonable lighting solution for the problems and visual tasks described above.

1. Vertical illumination on the instrument boards, system switching diagrams, and maps should be adequate for quick but comfortable visibility, especially for the many relatively small scales within glass-faced instruments.

2. Vertical illumination on these surfaces should not be so high as to make it difficult for the indicating lights on control and dispatching boards to be quickly distinguishable or the light beam galvanometer on the analyzer board to be easily read.

3. Illumination on the vertical plane should be reasonably diffused to minimize shadows, especially on the instrument scales.

4. Light sources must not present themselves as images of specular or veiling glare in the glass faces of instruments or other surfaces when viewed from the operator's usual working position.

5. Light sources must not present themselves as brightness areas in competition with the object being observed, namely, the instrument scales, the switching diagrams, the system maps, or the analyzer board elements.

6. Horizontal illumination working surfaces should be adequate for the type of task performed. In all cases it should be reasonably diffused and the source or any secondary reflecting surface should not cause reflected glare from the horizontal plane.

7. Brightness contrasts between various surfaces in the operator's normal field of vision should not cause visual discomfort.

8. Degree of perfection obtained in each category should be balanced by the actual cost of each incremental gain.

Associated Factors . . . Three factors to be discussed are emergency lighting, reflection factors of surfaces, and instruments and cases.

Emergency Lighting. In control rooms a firm service for the lighting system is necessary. During an emergency the operators must not be hindered in their efforts to restore normalcy.

A firm lighting source may be provided in several ways and the one chosen must fit into the general scheme of the plant layout. The important point is that the provision of an emergency source for lighting is not forgotten. This may be accomplished as follows:

Station Storage Battery. With this method the use of incandescent emergency lighting units must fit into the lighting design in such a way that adequate general illumination is provided in the required areas. Provision should be made for an automatic throw-over from normal lighting to emergency lighting when the former source of supply fails. The emergency lighting units should be energized periodically to assure reliability.

Alternate AC Source. By providing one or two alternate ac sources from separate transformers fed from separate buses, the possibility of not having power for lighting is reduced considerably. Also this method, if incorporated with an automatic throw-over, permits utilizing the normal lighting system for emergency use.

Reflecting Surfaces. In addition to the proper level and quality of illumination, correctly arranged within the room, a good installation must take into consideration all types of reflecting surfaces, both those included in the permanent building structure and those provided by the furnishings.

If proper attention is given to surface finishes and color, the over-all job will be more nearly correct from the visual standpoint and will supplement and aid a lighting system. Some important factors are:

Board Finish. Following the dissemination of knowledge on brightness contrasts, black backgrounds for instruments have been changed so that today the choice of pastel shades has become widespread. These surfaces should be a matte finish and the color and reflection factor so chosen that the visual surrounding is enhanced.

Furniture Finishes. To decrease the ratio of brightness between the work (letters, etc) and desk top, it is preferable that desks have higher reflection factors* than the usual mahogany or dark green linoleum top units. To reduce reflected glare, the top surface should be matte rather than glossy finish. Use of glass tops should be prohibited. Those conditions also apply to machines such as typewriters, billing units, etc. Any parts of these machines which are specular should not be tolerated.

Room Finishes. Selection of room finishes influences brightness patterns in the office and the relation between brightnesses of walls, ceilings and desks and the task which is before the worker. Ceiling finish is the most important factor and should be selected with the highest reflectance that can reasonably be obtained and should have a matte surface. Ceilings, walls, and floors act as secondary light sources by virtue of their reflecting ability.

The Committee on Office Lighting of the Illuminating Engineering Society has recommended that the following reflectances will give good brightness ratios in an office environment:

Ceilings	85%
Walls	60%
Desk Tops	35%
Furniture	35%
Floors	30%

Color. Foregoing suggestions permit the use of white or off-white, yellow, ivory, and cream tints, but most often preclude green and blue unless they are not very saturated. Acoustical tile and plaster, having sound absorbing cavities, also absorb light in the holes, and therefore the surface of these tiles should have a high reflection factor and preferably be white in color. Walls should not have reflection factors higher than 60% so that the brightness thereof will not be excessive. If a dado is used along the lower wall area, a desirable

*Armstrong Linoleum: Cat 415, Blond Tan; Cat 416, Mistic Green.

TABLE II — GENERAL CHARACTERISTICS OF LIGHTING SYSTEMS

Factors Considered	Luminous Ceiling System			Combination System	Direct Systems		Remarks
	Indirect	Louvered	Solid	Direct—Indirect	Direct	Special Ceiling	
Uniform Horizontal Illumination	Excellent	Excellent	Excellent	Excellent	Good	Good	A requirement on the operator's desk, dispatching and calculating tables
Uniform Vertical Illumination	Good	Excellent	Excellent	Good	Good	Good	A requirement especially on the upper half of the control, dispatching, and analyzer boards
Low Fixture Brightness	Excellent	Good	Good	Good	Good	Good	Desirable
Low Ceiling Brightness	Fair	Good	Good	Good	Good	Good	Desirable
Ceiling Height Required	High	High	High	Medium	Low	Low	Lower ceilings reduce plant cost
Ceiling Specularly Reflected from Instruments	The higher the illumination level the more reflection	Less evenly luminous—more reflection	Same as louvered plus traces from solid supports	Negligible in most directions	Negligible in most directions	Negligible in most directions	Should be negligible
Fixtures Specularly Reflected from Instruments	Can be made negligible with difficulty	Can be made negligible	Can be made negligible	Can be made negligible	Can be made negligible easily	Can be made negligible easily	Should be negligible
Relative Cost	Medium	High	High	Medium	Low	Low	Should be low
Shadows-Instrument Scales and Boards	Negligible	Negligible	Negligible	Negligible	Fairly pronounced	Negligible	Harsh shadows undesirable
Brightness Contrasts on Principle Work Planes	Within accepted limits	Within accepted limits	Within accepted limits	Within accepted limits	Within accepted limits	Within accepted limits	Brightness contrasts should be small preferably within a ratio 1:3 but acceptable if within 1:10
All Room Surfaces	Within accepted limits	Within accepted limits	Within accepted limits	Within accepted limits	Within accepted limits but not so good as luminous ceiling	Within accepted limits but not so good as luminous ceiling	Brightness contrasts should be small preferably within a ratio 1:3 but acceptable if within 1:10

CENTRAL CONTROL ROOM has boards with many and often very small instruments. For viewing without visual discomfort an average vertical illumination (upper third of board) of 20 ft-c is provided. Lighting of instruments is a challenge

color to use would have a reflectance of at least 30 to 35%. Similarly, it is beneficial to have floor reflectances as high as 30% and not less than 20%.

A suggestion is that color be used to make the working enviornment interesting and pleasant. Cream, ivory, and buff seem warm and they may make an area appear small. On the other hand, a room may be made to seem larger and cooler by selecting colors such as green, blue-green, and blue which seem to recede. Gray finishes are neutral and excellent for either the background or for furniture and machines. Use of gray for both background and machines, however, can be very monotonous and result in an unsatisfactory environment.

Instruments. A challenge to an illuminating engineer is the lighting of instruments on a control board, the primary objects to be seen by an operator. Two separate problems have existed up to recent months, one of which still lacks complete solution.

In the first place scales of instruments have had shadows. The ability of an operator to read the scales was greatly reduced at relatively small angles from the instrument plane. Attempts have been made to incorporate light transmitting media in the frame tops. More recently several manufacturers have announced widely different answers to both these criticisms with encouraging results.

The unsolved problem concerning instruments is the black surfaces of the enclosing frames. Some manufacturers of electrical instruments recently agreed to change to pastel shades if customers specified the colors. This trend is good but the major problem exists in the larger recording and indicating instruments such as those used in recording air flow and boiler feed pump data. These are large sore spots on the instrument panels from a visual standpoint.

Methods of Lighting . . . The advantages of fluorescent lighting methods have gradually made these lamps the preferred sources for control rooms, dispatching centers, and system analyzer rooms.

All conventional lighting methods may find application in these problems but in general the following systems seem to be preferred:

1. Luminous Ceiling Systems
   - Indirectly lighted ceiling
   - Louvered ceiling
   - Solid luminous ceiling
2. Direct Systems
   - Ordinary—Flush troffers (open, louvered, glass panel, and lens)
   - Special—Ordinary troffers in a specially designed ceiling
3. Combination Systems
   - Direct troffers supplemented with indirect components

Table II summarizes the principle attributes of each lighting system.

From the tabulated remarks it is observed that luminous ceiling systems minimize shadows on the vertical and horizontal planes whereas the ordinary direct systems would trend toward sharper shadows. Direct systems, however, are less costly and they project light more efficiently upon specific working surfaces. Direct lighting techniques in combination with special ceilings possess the advantage of efficiency and low cost and can be designed to make shadows negligible. In addition the sources of light can be shielded, an important factor to be considered. Combination systems, consisting of direct troffers with indirect lighting elements supplementing them can be designed to utilize efficiently the light flux from troffers. This combination reduces contrast between troffers and the adjacent ceiling and improves good brightness ratios throughout the room.

It is observed therefore that lighting of control centers requires very special considerations which for the most part do not exist, in such extreme measure, in ordinary office lighting projects. These special factors do limit the technique one may utilize in obtaining lighting results unless the factor of economy is disregarded totally. As economy plays a more important part then the reasonable solution based on pure lighting considerations finds its place in a much more narrow field, the direct lighting systems.

Standardization Features New Commercial Offices

DAVID J. DOUGLAS
Manager, Lighting Sales
Jersey Central Power & Light Co
Asbury Park, N. J.

Five commercial offices recently placed in operation by Jersey Central Power & Light Co are located at Belmar, Lakewood, Long Branch, Red Bank, and Seaside Park. They have similar layouts with plenty of area to accommodate many customers at one time and to provide showroom space for appliance dealers.

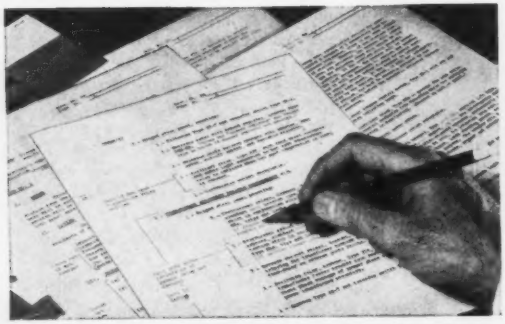
A warm effect is provided by an interior finish of natural knotty pine, light linoleum flooring, and soft-tone oak furniture.

Interior lighting is furnished by ceiling surface-mounted units with 48 in. and 96 in., T-12, 425 ma lamps. Show windows have swivel units, each with a 150-w PAR flood lamp. Illumination ranges from 50 to 60 ft-c.

First three offices are readily identified by outdoor signs of porcelain-enameled steel, letters of stainless steel, and indirect lighting by a double row of 72 in., T-8, 300 ma lamps.

Seaside Park office harmonizes with the semi-residential area.

How to speed plant expansion



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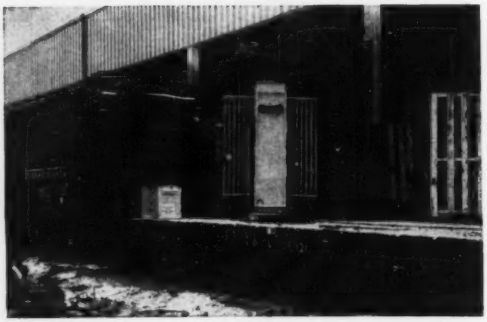
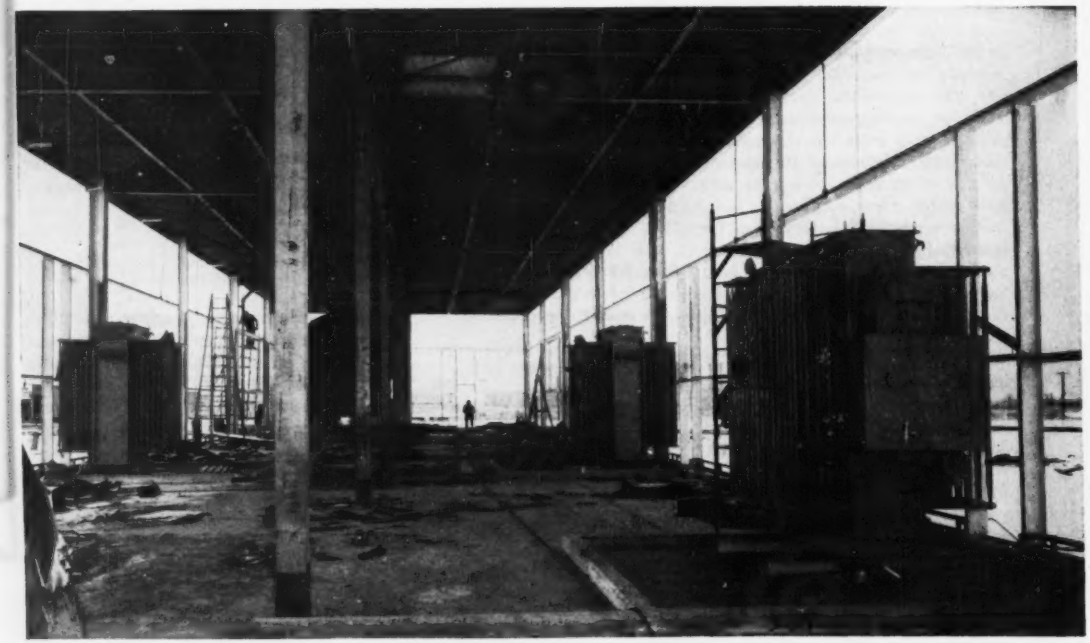


2. YOU GET EASILY-ASSEMBLED UNITS. Instead of getting many individual items to install piece-by-piece, you get a few completely co-ordinated, easy-to-assemble units.



ONE OF WORLD'S BIGGEST MANUFACTURERS expands quickly with G-E power units, as shown above. Note that your power system can be installed before completing construction, giving you ample power to speed the rest of the job.

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For assistance in modernizing or expanding your electrical system to meet today's greater production, send for this new 24-page booklet. Ask for Bulletin GEA-5600.

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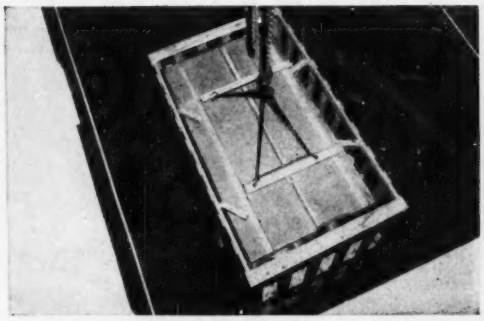

3. EASILY HOISTED OR PUSHED TO CONVENIENT LOCATION. Part of flexibility is ease of movement as well as adaptability. In photo above, complete metal-clad switchgear unit is hoisted to roof.

4. EASY INSTALLATION CONSERVES SKILLED MANPOWER. G-E metal-enclosed switchgear units contain all needed components—all co-ordinated. Just place units in position, make circuit connections.

No matter how much more production you need now, or will need in the future, here are four good reasons for investigating General Electric's "packaged" switchgear and unit equipment today:

SAVES TIME. Order standard G-E switchgear and load-center unit substations for your entire system early—install the pre-assembled units quickly. No waiting for "missing links." Easy planning, easy installation and operation. Releases valuable time of key men for other important duties.

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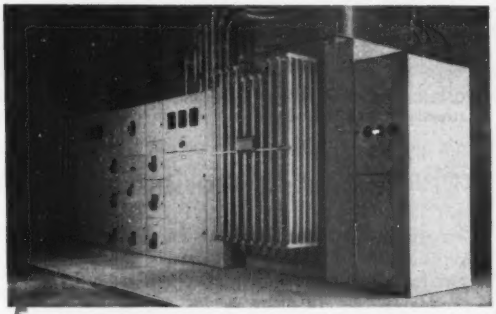
Get your vital electric power equipment in packages. Install the units like machine tools. For more information, call your local G-E Apparatus Sales Office—or write to *General Electric Co., Schenectady 5, N. Y.*



5. DEPENDABLE SYSTEM IN FRACTION OF USUAL TIME. Besides quick installation with compact load-center unit substations like the one above, you get maximum protection against power failure. New units easy to add if loads grow.

6. EASY TO MAINTAIN. Interlocks, metal-enclosed live parts protect personnel at all times. Above, air circuit breaker draws out like file drawer for inspection.

7. EASY TO RE-LOCATE. When power loads shift, simply disconnect cables and move whole unit. Metal enclosure means protection in any location.

GENERAL ELECTRIC

954-30

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

ONE CABLE per messenger is the distinctive feature of Class A aerial cable construction. Each messenger is hung from insulators and grounded at one end

THREE CABLES per messenger is the difference between Class A and B

Insulated Aerial Cable Messenger Maintains Service

F. W. CHAPMAN
Engineer and Manager
Commissioners of Public Works
Greenwood, S. C.

Aerial cable supported by messengers hung on insulators and grounded can remain in service even with a breakdown between phase conductor and messenger wire. Installations of this type made on the Greenwood, S. C., Commissioners of Public Works system may be cleared quickly by isolating the messenger from ground and leaving it energized until the fault condition can be located and eliminated by a trouble crew.

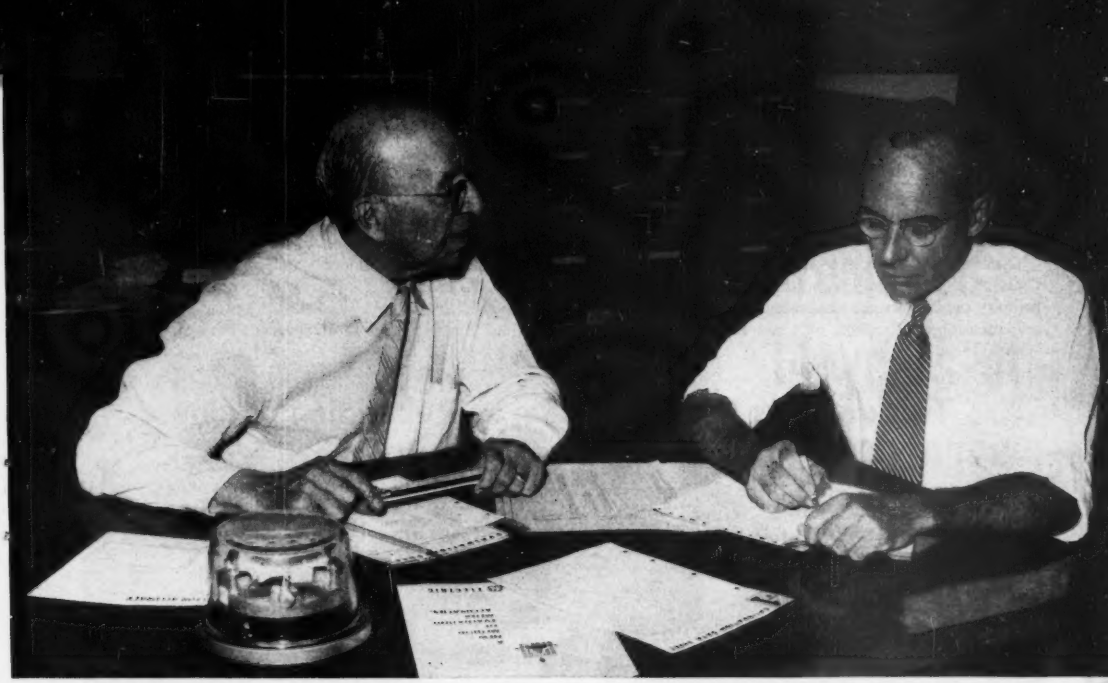
This construction (Class A) on the utility's 4.16-kv wye, solidly grounded, common neutral system consists of a phase conductor supported on an independent messenger, with each messenger carried by spool type insulators and grounded at one end of the line through copper wire or fuses of somewhat smaller capacity than the phase conductor. Only one end of the messenger should be grounded as the circulating current which would flow through grounded parallel messengers will consume an amount of power which would more than offset any possible saving resulting from the larger effective ground wire produced by parallel connection.

Non-Conducting Support

It is essential that the phase wire be attached to the messenger with a non-conducting support. At present AT&T marline twine support is used. A metallic hangar, like the standard telephone cable clip, will form a shorted secondary. A long double arming bolt is used to hold two spools on one side of pole and one on other. Ends of bolt are supported by ordinary braces attached above the cable on straight runs. Clevis type spool supports are needed for turns and deadends. It is good practice to mount the primary cables about 3 ft from the top of the

"Ice Tongs" Handle Scrap Wire

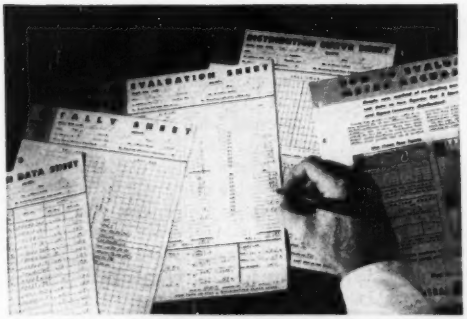
ICE TONGS used by California Electric Power Co to handle scrap wire save time and temper. On a mobile derrick line they load or unload scrap bins two or three times as fast as it can be done by hand, according to A. J. Scott, general storekeeper



METER SUPERINTENDENT W.C. QUANDT DISCUSSES BAR X AND SIGMA METER EVALUATION METHOD WITH L. RAGLE, PUEBLO DISTRICT MANAGER

Western Utility Adopts Meter Evaluation Method

TEST DATA for single-phase meters are recorded to nearest 0.1% by Southern Colorado Power Company meter tester.



USING EVALUATION FORMS, Meter Superintendent Quandt calculated Bar X (average accuracy) and Sigma (accuracy distribution). He found the method best for analyzing accuracy.

Southern Colorado Power finds Bar X, Sigma method best for analyzing accuracy of watthour meters

Southern Colorado Power Company became one of the first utilities to adopt the Bar X (average accuracy) and Sigma (accuracy distribution) method for evaluating meter test data.

Reports Meter Superintendent W. C. Quandt, "We have found that this method offers an excellent means for quickly reducing masses of test data to a simple, understandable form. Now, we can evaluate and compare groups of meters on a highly factual basis. That's why we are using and recommend this method."

General Electric uses this method in factory certifying I-50 meters. The limits are: Bar X within $\pm 0.1\%$ and Sigma within 0.15% on full load and 0.20% on light load. Also, 99.9% free from defects that might cause improper registration or operation. For complete information, call your G-E representative or write for bulletin GED-1408; Section 601-79, General Electric, Schenectady 5, New York.

SEND TODAY FOR COMPLETE SET OF METER EVALUATION FORMS

Section 601-79
General Electric Co.
Schenectady 5, N. Y.

Please send me a set of evaluation forms (GEA-332) ☐
plus a descriptive brochure (GED-1408). ☐

NAME_____ POSITION_____
COMPANY_____
ADDRESS_____
CITY_____ STATE_____

GENERAL ELECTRIC

pole and run a galvanized messenger at the top of pole where trees grow above the cable.

Class B construction is similar to Class A construction except that all primary conductors are supported by one messenger. Erection of Class B cable on one insulator per pole has been found to be no more expensive than the standard method of supporting cable. Aerial cable insulated for 5 kv is used on the system. Arresters rated at 3 kv are always placed at the ends of the cable and where any taps are made to the aerial cable.

So far no trouble has developed in any of the aerial cable in use, including standard or Class C. However, linemen are instructed to regard the aerial cable system as being energized until proven otherwise.

Truck Moves Poles 9 Ft; Saves Rebuilding of Line

POLE HAULING TRUCK was used very effectively to move a 4-kv line 9 ft to clear the way for street widening. Fifteen poles were moved in one day

Versatility of a new heavy-duty "pole hauling and setting" truck was demonstrated when a pole line carrying four 4-kv feeders (16 wires of 1/0 copper) had to be moved a distance of 9 ft over an intervening duct line. Reason for the job was a street widening project.

S. H. POLLOCK
Assistant Superintendent
Overhead Department
Kansas City Power & Light Co

In moving the line the truck saved the rather heavy cost of a complete rebuild job. The line was old enough, and had sufficient slack to permit moving it. An underground duct line which was directly behind the poles prevented a trenching job.

Poles were pulled with the special truck. Using the compound low gear and moving at a crawling speed, the truck backed 9 ft and dropped the pole in the new hole. The butt of the pole was snubbed to the base of the truck and side lines held the top of the pole. In one day 15 poles were moved.

Truck Has Special Features

Main features of the truck are these. Tandem rear wheels provide a steadier truck bed from which to work. A compound low gear gives crawling speeds for spotting heavy loads. Hoisting boom swivels a full 360 deg so that poles can be picked up from either side. Boom is adjustable to lengths of 16 ft, 24 ft, or 32 ft; base of the boom can be located at the top or bottom of the upright.

Outriggers enable the truck to pick up loads over the sides. Maximum design load with short boom is 6,000 lb. A minimum of 1,000 lb can be handled with boom fully extended sideways.

Fluorescent-Mercury Lamp Produces Golden White Light

A new light source, known as the J-H1 fluorescent-mercury vapor lamp, produces a golden white light heretofore unavailable from a single mercury light source. The lamp makes use of a phosphor coating to produce illumination suitable for industrial, street, and outdoor lighting.

This lamp, rated 400 w and 18,000 lumens, is the first of a new series and was developed by Westinghouse Lamp Division. Electrically, the n 400-w lamp is like the 400-w A-H1 and E-H1 types. It operates from H-1 ballasts, will burn in any position and can generally be used in existing fixtures for 400-w mercury lamps.

EUGENE W. BEGGS
Westinghouse Lamp Division
Bloomfield, New Jersey

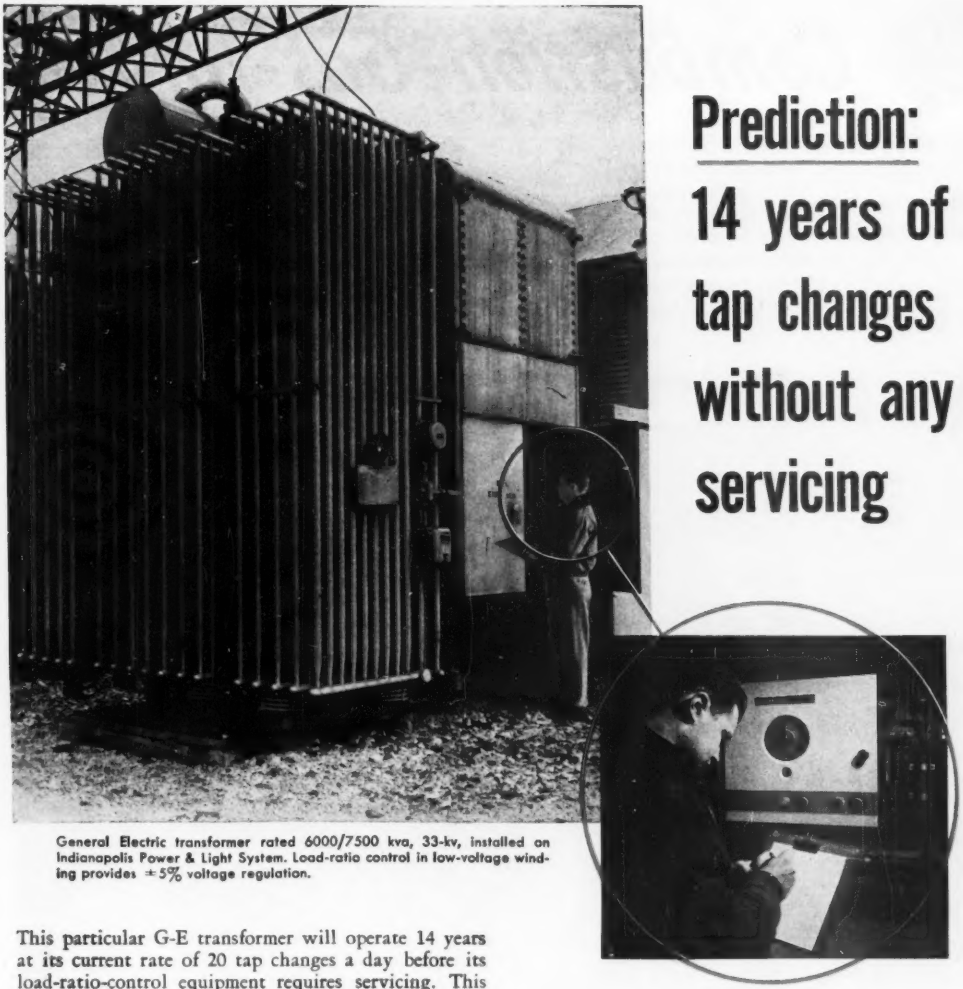
The J-H1 lamp has a BT-37 bulb, a shape newly developed for mercury lamps. This design provides the best operating temperature over the entire bulb wall. It permits a special phosphor coating applied to the inside surface of the bulb to function at maximum efficiency. When activated by the invisible ultraviolet light generated by the quartz arc, the phosphor fluoresces red which with the blue, green, and yellow light of the mercury arc provides a golden white light.

The new lamp will produce 20% more light than the familiar 400-w A-H1 mercury lamp and of a color quality approaching that of commercial fluorescent lighting. The lamp can usually be burned in the same sockets without the need for additional equipment. The lower brightness generally makes operation practicable at somewhat lower mounting heights.

Enclosed fixtures are recommended for outdoor use to protect the glass from a driving rain or from large

(Continued on page 110)

Prediction: 14 years of tap changes without any servicing



General Electric transformer rated 6000/7500 kva, 33-kv, installed on Indianapolis Power & Light System. Load-ratio control in low-voltage winding provides ±5% voltage regulation.

This particular G-E transformer will operate 14 years at its current rate of 20 tap changes a day before its load-ratio-control equipment requires servicing. This means that for 14 years the maintenance crew will not have to clean insulating surfaces or filter the contactor oil! In fact, the contactor compartment need not be opened during this entire period.

The really significant point, however, is this: We can tell you—and do tell you for each transformer—how many operations the LRC equipment will make before any servicing is required. We have tested the contacts of each design until we know, accurately, the life of the arcing tips. By the use of electrostatic shielding, and by having a major portion of creepage distances in the vertical plane, we prevent dangerous deposits of carbon from forming on insulating surfaces during this period.

In other words, with G-E load-ratio-control equipment, you don't do any *unnecessary* service work. You simply refer to the instruction book and read the counter to predict the time that servicing is actually required.

Over 37,000,000 installed kva have proved that General Electric LRC is as reliable as the core and coils themselves. Call on your G-E representative for a complete discussion on the LRC transformer best suited to your application. *General Electric Co., Schenectady 5, N. Y.*

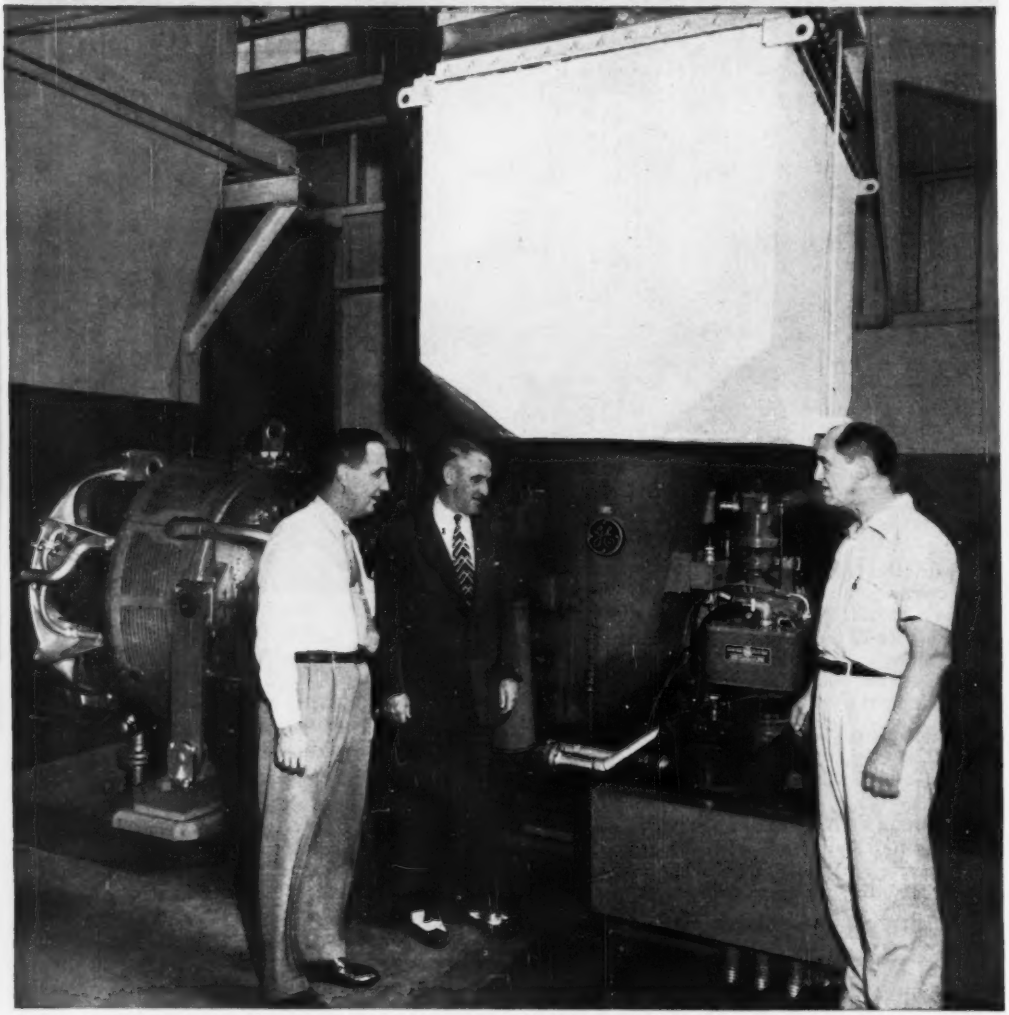
401-18

GENERAL ELECTRIC

Combustion-Gas-Turbine

Total Installed Hours	17,604
Hours in Service	15,241
Total Power Produced in KWH	66,465,000
Average Load	4361 KW
Hours Scheduled Out	2326
Hours Forced Out	37
Unit Capacity Factor	124.6%

*A duplicate unit has just been ordered for installation in this station.



Donald S. Kennedy, President of Oklahoma Gas and Electric, inspects the 3500-kw combustion-gas-turbine at the Belle Isle Station with C. C. Willis (extreme left) Superintendent of Generation at O.G. & E. and G. D. Conley (extreme right), Chief Engineer at Belle Isle Station.

*completes 2 years at Belle Isle**

"Surpassed Expectations" says Donald S. Kennedy, President of Oklahoma Gas and Electric.

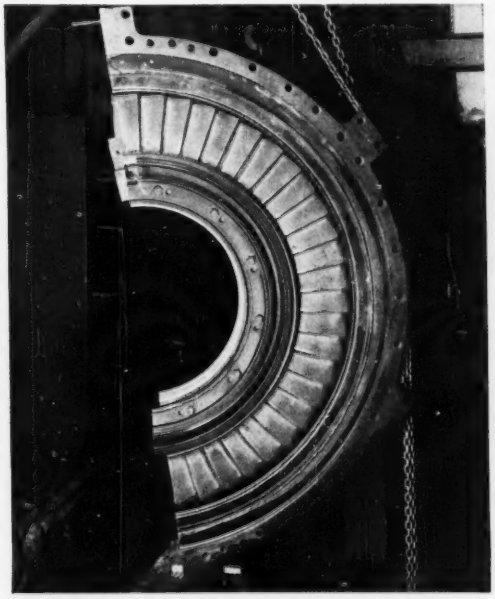
The first combustion-gas-turbine to be placed in commercial service in America has completed its second year of successful operation at the Belle Isle Station of the Oklahoma Gas and Electric Company. On the line since July 29, 1949, the 3500 kw unit has established a record which has surpassed contract commitments for both capacity and economy.

Donald S. Kennedy, President of the Oklahoma Gas and Electric Company, hailed the unit as eminently successful. "The combustion-gas-turbine at Belle Isle has been easily operated and maintained by our regular plant personnel. Maintenance costs have been lower and kilowatt output higher than we had anticipated. The output has averaged well over 100 per cent. Availability has been consistently high with only thirty-seven hours forced outage, due largely to the failure of a lube oil pump impeller. For availability, economy, and capacity, our gas-turbine has surpassed expectations."

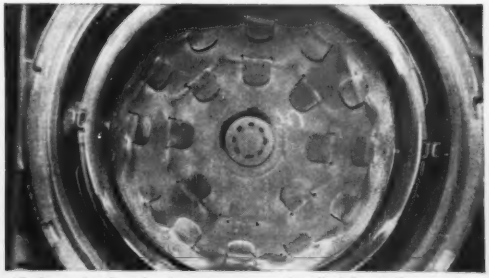
General Electric combustion-gas-turbines are available in both 3500 kw and 5000 kw ratings. For complete details call your nearest G-E sales office or write for Bulletin GEA-5516, "Gas Turbine Power Plants." General Electric Company, Schenectady 5, New York.

11,823-HOUR INSPECTION REVEALS EXCELLENT OPERATING CONDITION

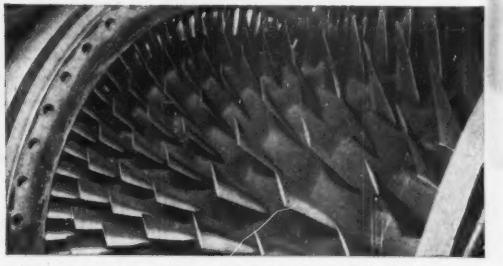
A routine semi-annual inspection of the Belle Isle gas turbine was held in March, 1951. This careful check-up on all original parts failed to uncover any major components —either rotating or combustion—which required replacement.



This half-section of the second-stage nozzle diaphragm had undergone almost no deterioration in twenty months of service. Its condition, typical of all diaphragm pieces, warranted no maintenance.



All six combustion chamber caps were reinstalled for further service. The discoloration around the gas fuel nozzle of this cap is a deposit of noncombustible residue from the fuel.



The compressor rotor, shown here with the top half of the casing removed, had collected a slight amount of dirt but was otherwise in original condition.

GENERAL ELECTRIC

235-5

Fluorescent-Mercury Lamp

(*Continued from page* 106)

moisture-laden insects. Outdoor type ballasts should be used to withstand exposure and to provide the proper electrical values.

Fluorescent-mercury lamps of the 400-w size have been applied to floodlight large indoor and outdoor areas of the Chicago park system and on a boardwalk along the New Jersey shore. The New Jersey Turnpike Authority had adopted the new lamps for all service areas along the 118-mile toll road and at the administration building in East Brunswick, N. J.

Although the principal application of the new lamp is as a light source for industrial plants, outdoor floodlighting and for street lighting, another application is modernization of existing A-H1 installations.

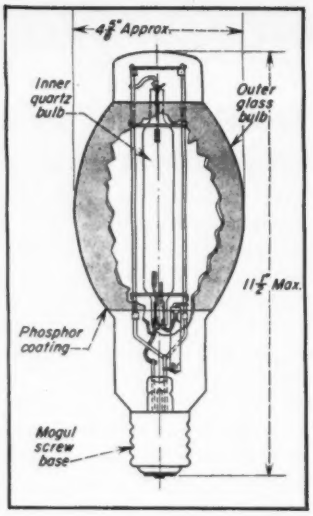
Vital Statistics for Lamp J-H1

Watts (lamp only)	400
Base	Mogul screw
Burning position	No limitation
Overall length	11.5 in.
Light center length	7 in. (approx.)
Rate initial lumens	18,000
Rated average life	4,000 hr*
Open circuit voltage	27 **
Operating volts	135 (approx.)
Starting amperes	4.7 (approx.)
Operating amperes	3.2 (approx.)
Starting time	4 min
Restriking time	4 min

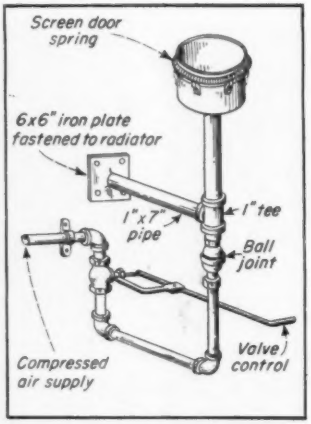
* Under specific test conditions at five or more burning hours per start.

** For normal indoor use. Higher open circuit voltages are desirable for dependable starting at lower temperatures.

LIGHT SOURCE (right) has phosphor coating (shaded) on outer glass wall which is activated by ultra violet light to produce red light. Combination of red light and blue, green, and yellow light of mercury arc provides golden white light



GLOVE INFLATOR, made in company shop, speeds rubber glove inspection



SIMPLY CONSTRUCTED, inflator was made from pipes and parts on hand

Inflator Speeds Rubber Glove Testing

C. F. TWYNAM
Louisville Gas & Electric Co
Louisville, Ky.

Visual inspection of rubber gloves for defects and injuries is facilitated by an inflator which enlarges gloves, making it easier to see faults. The inflator was built at nominal cost with materials on hand in the shops of Louisville Gas & Electric Co. For convenience it was fastened to a radiator in the shop. It is controlled by a valve for turning compressed air on and off.

The body was made of half of a 4-in. wrought iron coupling of the type used at welded joints of a gas pipe. A bottom was welded to the lower end of the body and in the center of this a 4-in. piece of ¾-in. pipe was welded, the weld being made to the inside of the body. A 13-in. piece of ⅜-in. pipe was welded to the bottom of the ¾-in. pipe. The ⅜-in. pipe was threaded on the lower end.

Support for the inflator was provided by a 7-in. piece of 1-in. pipe welded to a 6 in. by 6 in. iron plate at one end and threaded into the back side of a tee. A piece of 1-in. pipe, 14-in. long, was threaded to the upper part of the tee. The flat piece of iron was fastened to the radiator.

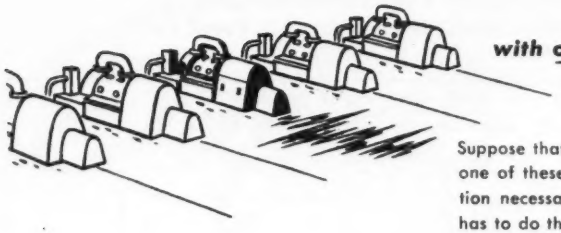
Uses Local Air Supply

The ⅜-in. pipe was then placed in the 1-in. pipe, the ⅜-in. pipe extending about ¾ in. below the bottom of the tee. A ball joint was attached to the ⅜-in. pipe and the pipe was extended through a series of elbows and nipples to a whistle valve which was fastened to the wall. The shop's compressed air is piped to the valve which is controlled by a foot treadle or a knee lever.

A pipe plug with No. 30 hole drilled in it can be screwed into the ¾-in. pipe just inside the inflator body in case the air supply is too strong. This will cut down the rush of air into the uninflated glove.

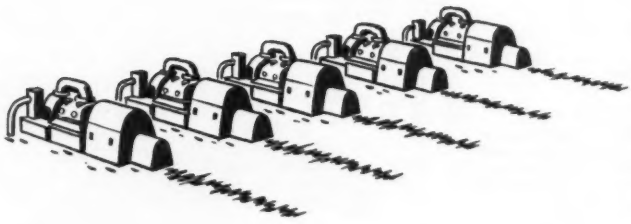
An ordinary ½-in. screen door spring is fitted between the glove bead and the flange of the inflator body to hold the glove in place. A groove is machined at the top of the inflator body for this purpose. The spring can be slipped into place easily as gloves are put on the inflator.

Here's how to make big load swings look small



with one unit regulating . . .

Suppose that you have a station with five generators, but only one of these takes the minute-to-minute variations in generation necessary to follow customer loads. When a single unit has to do the whole regulating job, its output has to vary over a wide range, from part load to full load—often at fast rates of change.



with all units regulating . . .

But if all units share in the regulation, each varies its output over only a narrow range. Each unit's rate of load change is correspondingly slower.

Take a specific example: a 100-Mw station, with five 20-Mw units gets a 10-Mw load change. When only one unit regulates, that unit has to change output by 50 per cent of its capacity. But if *all five units* share regulation, each feels only a 10 per cent change.

Multiply this example by the total number of units in your system . . . and you'll see that if all units participate in regulation, short-time load changes get stretched so thin that loading on individual generators is practically unaffected by "fringe" variations.

The way to distribute load changes efficiently and automatically is through L&N Unit Load Control. This equipment permits assignment of loads to generators in practically any desired manner—to keep them equally loaded, to divide in proportion to ratings, to hold specified units at base loads while others regulate—whatever the station operator decides is needed. Proved by years of service, this control plays a vital role in major systems.

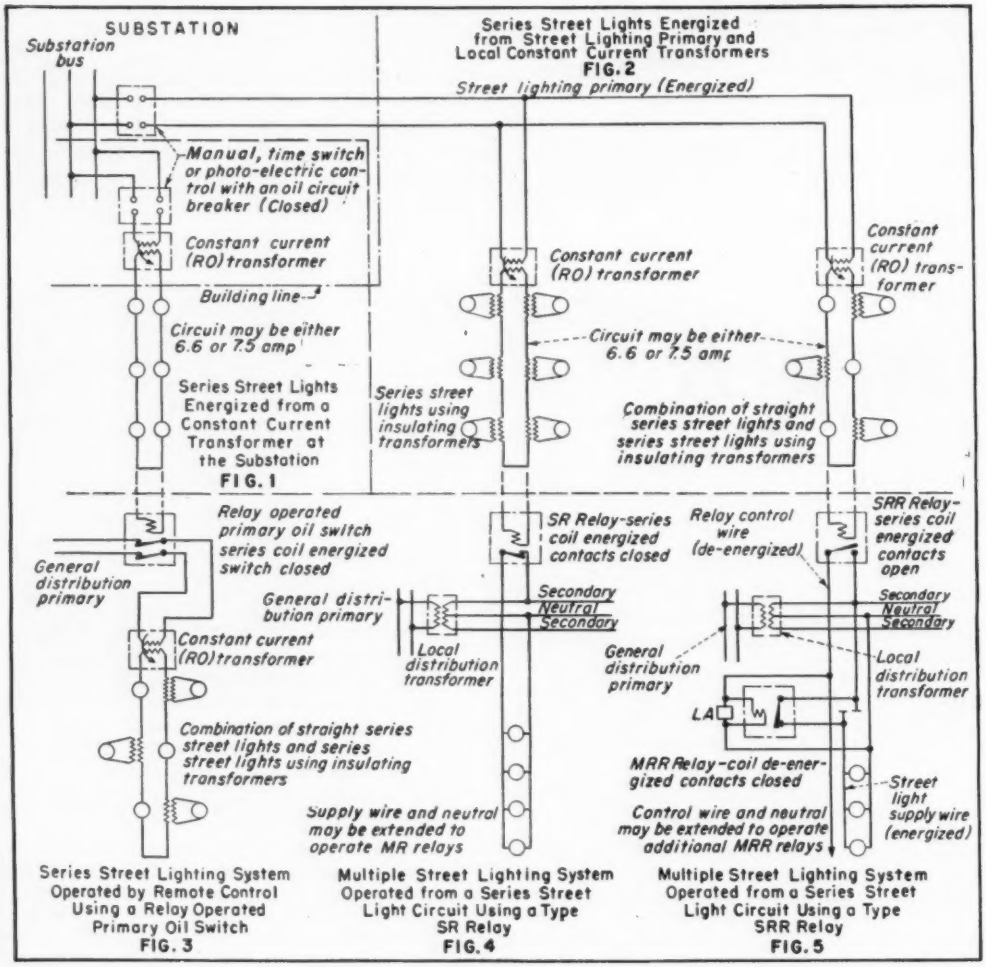
For further information, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Jrl. Ad. ND4-56-461(6)

Street Lighting - - Series Systems

Methods of energizing, control, and operation, separately or in conjunction with sections of multiple systems. All equipment shown in night-time operating position with all lamps energized. An adaptation from construction standards of Consumers Power Co


SUBSTATION
Substation bus
Manual, time switch or photo-electric control with an oil circuit breaker (Closed)
Constant current (RO) transformer
Building line
Circuit may be either 6.6 or 7.5 amp
Series Street Lights Energized from a Constant Current Transformer at the Substation
FIG. 1
Relay operated primary oil switch series coil energized switch closed
General distribution primary
Constant current (RO) transformer
Combination of straight series street lights and series street lights using insulating transformers
Series Street Lighting System Operated by Remote Control Using a Relay Operated Primary Oil Switch
FIG. 3
Series Street Lights Energized from Street Lighting Primary and Local Constant Current Transformers
FIG. 2
Street lighting primary (Energized)
Constant current (RO) transformer
Circuit may be either 6.6 or 7.5 amp
Series street lights using insulating transformers
Combination of straight series street lights and series street lights using insulating transformers
Constant current (RO) transformer
SR Relay-series coil energized contacts closed
General distribution primary
Secondary
Neutral
Secondary
Local distribution transformer
Supply wire and neutral may be extended to operate MR relays
Multiple Street Lighting System Operated from a Series Street Light Circuit Using a Type SR Relay
FIG. 4
Relay control wire (de-energized)
SRR Relay-series coil energized contacts open
Secondary
Neutral
Secondary
General distribution primary
Local distribution transformer
LA
MRR Relay-coil de-energized contacts closed
Control wire and neutral may be extended to operate additional MRR relays
Street light supply wire (energized)
Multiple Street Lighting System Operated from a Series Street Light Circuit Using a Type SRR Relay
FIG. 5

LEGEND

L.A.	Lightning Arrestor		
Relay, SR	Series relay whose contacts are open when the series coil is de-energized.	Relay, MR	Multiple relay whose contacts are open when the coil is de-energized.
Relay, SRR	Series relay whose contacts are closed when the series coil is de-energized.	Relay, MRR	Multiple relay whose contacts are closed when the coil is de-energized.

Safest TO WORK HOT

Attachment of an O-B Clamptop insulator to the conductor is made with a compact clamping member compressed by two hex nuts. This member, smaller than a man's fist, is the only charged portion when making a hot stick installation. It is handled by a simple socket wrench that offers a minimum chance of slipping or otherwise going out of control. Final installation is stronger than the best hand-made tie, and permanent . . . Compare this with installing a hot tie. The end of the tie wire describes a large circle through the air, in whose area full line potential exists. The end of this tie wire may snap or spring out of control. And when installed, a weak connection of no real permanence has been made . . . Since hot line construction and maintenance is growing with the demand for power continuity, prepare for doing this faster, better, and safer by building with O-B Clamptop insulators; either conventional pintypes or posts.

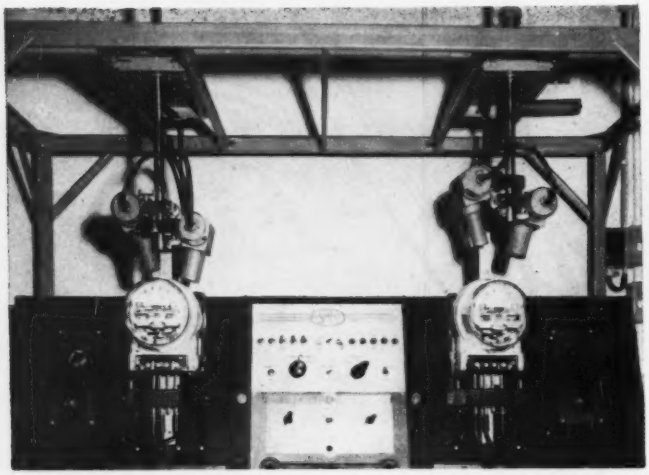
Ohio Brass

MANSFIELD • OHIO

4137-M

Bridge Carries Photoelectric Meter Tester

D. INKSTER
Supt of Electric Meters
Winnipeg Electric Co
Winnipeg, Manitoba



OVERHEAD BRIDGE carries two motor-operated photoelectric timers over meter test table. Ease of positioning photoelectric units reduces testing time per meter

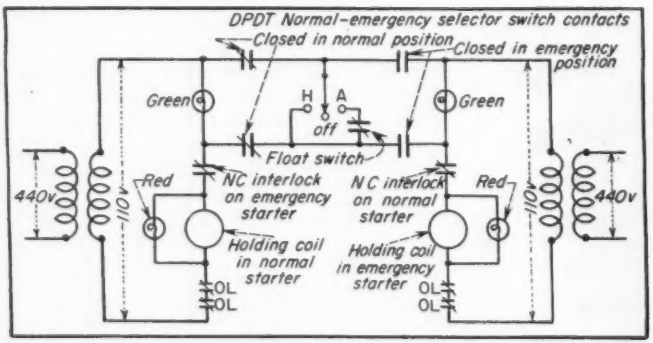
An overhead carrier for mounting photoelectric timing equipment over a meter testing table has permitted one operator to check as many as 100 meters per day at Winnipeg Electric Co. Manitoba, Canada. The main advantage of the carrier is that the light and photoelectric cell can be spotted quickly in the proper position in front of the meter by raising or lowering a motor-driven tube.

Formerly this equipment was mounted on a post in front of the meter under test. After each test the post had to be swung out of the way so that adjustments could be made on the meter. However, to bring the photoelectric testing equipment back to the proper operating position, considerable time had to be spent locating a definite operating "spot" on the meter disk.

The overhead carrier consists of a double bridge crane operating on small rollers equipped with ball bearings. The motor-operated raising and lowering mechanism is built of a brass tube threaded on the outside and into the center of a gear which engages the motor gear. This brass tube moves up and down with the gear but is prevented from turning by a spring clutch keyed on the outside. The tube can be turned by hand for front or side positions. The photoelectric equipment mounting post is held in position in the center of the tube by a locknut. By releasing the locknut, the post can be moved up or down.

Emergency Starter Insures Pump Operation

FRANK E. REEVES
Director Electrical Instructions
Baton Rouge, La.



PUMP CONTROL diagram shows selector switch which permits transfer of control of deep well pump motor from one control center to the other during emergencies. Normal starter is in Center No. 1 and emergency starter is in Center No. 2

An emergency starter for a deep well pump motor can be so connected as to insure automatic operation from a separate power source under emergency conditions. Normal feed to the motor is from a one starter section of the motor control center.

An identical emergency starter in another section is electrically interlocked to prevent simultaneous closure of the two starters. It is essential that buses in the two sections be isolated from each other. This will prevent short circuit currents from exceeding interrupting capacities of the 600-v feeder circuit breakers in the station service power center. A 2-position, double-pole selector switch on the panel of one section permits transfer of the deep well pump motor and its control switches to the other section in the event of trouble on the first section of the equipment feeding the deep well pump.

Each section is fed from a separate 750-kva transformer which is located in the 1,500-kva station service power center.

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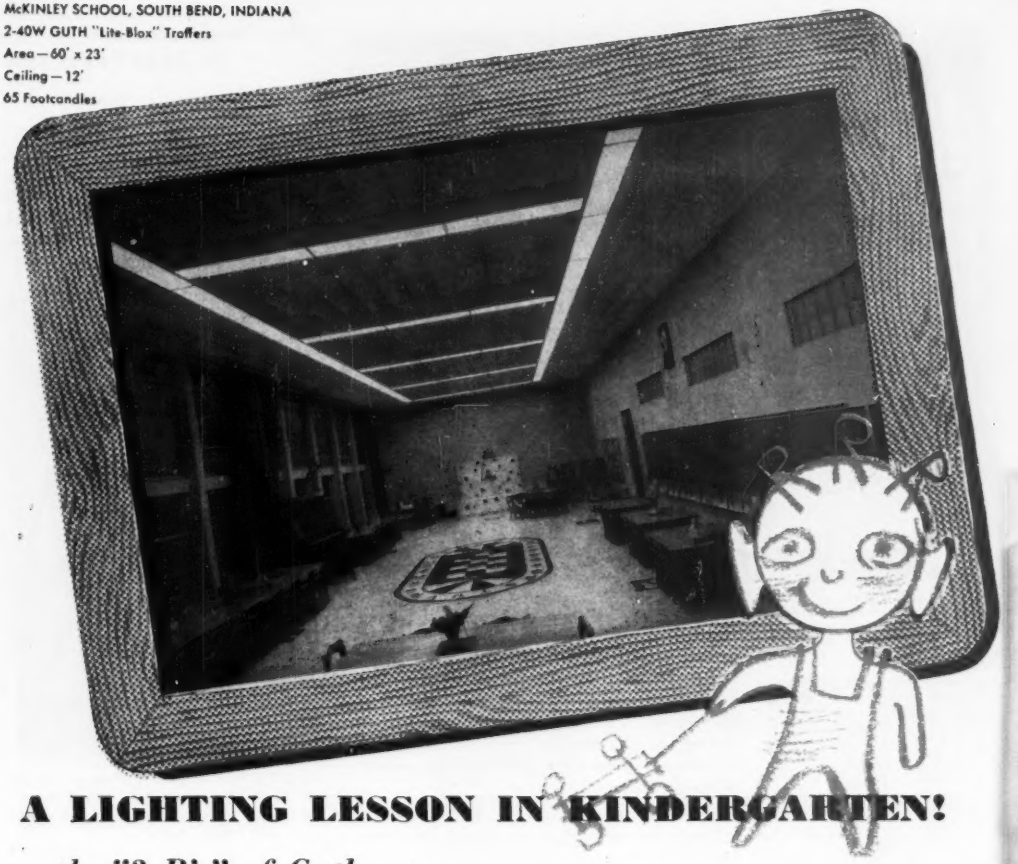
McKINLEY SCHOOL, SOUTH BEND, INDIANA
2-40W GUTH "Lite-Blox" Troffers
Area—60' x 23'
Ceiling—12'
65 Footcandles



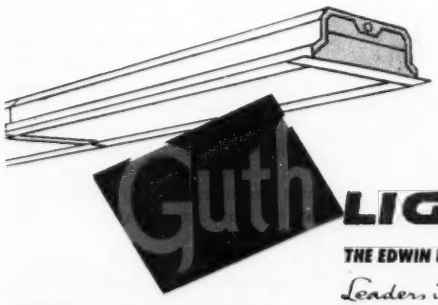
A LIGHTING LESSON IN KINDERGARTEN!

the "3 R's" of Guth
precision-planned school ***lighting:***

Right design
Rugged construction
Reliable performance

In classrooms from kindergarten to college, GUTH fixtures are made to solve the toughest lighting problems. They combine the finest illumination for modern education with important economy in purchase, installation and maintenance.

For more information on GUTH *Precision-Planned* School Lighting, contact your nearest GUTH resident engineer or write for our School Lighting Catalog.



LIGHTING

THE EDWIN F. GUTH COMPANY / ST. LOUIS 3, MISSOURI

Leaders in Lighting Since 1902

865

RCA MICROWAVE SYSTEM

Two links of receiving and transmitting antennas of Central Arizona Light & Power Co., located on roof of generating plant.

RCA Microwave Transmitter-Receiver. The generating plant and each switching station has a transmitter-receiver.

SINCE June 1949, the Central Arizona Light & Power Company, Phoenix, Arizona has used an RCA Microwave System for remote control of switchgear . . . telemetering of voltage, current and power . . . two-way voice communication —between a generating plant and two remote switching stations.

Despite severe lightning storms, temperatures of 140 F, unusual exposure to wind, sand, dust, and insects, RCA Microwave equipment has provided excellent continuity of service.

Reliable Performance, Lower Costs

This modern system of communication costs less per mile to construct and operate than conventional wire or carrier current systems. Parabolic antennas focus transmitted signals to span distances up to 35 miles. Repeater stations provide a path for signals over mountains, rivers and rolling countryside. The equipment is designed for unattended operation and may be installed at locations which are inaccessible for periods of several months. Channels are provided for supervisory control, teleprinter, facsimile, two-way radio, and many other circuits.

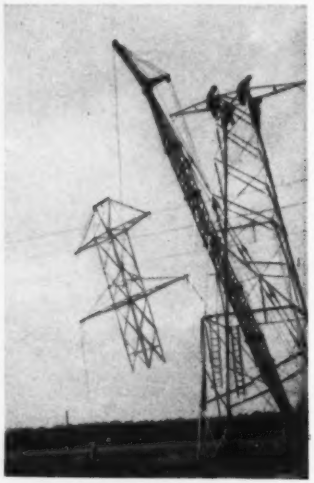
RCA engineers are at your service for consultation on microwave systems. Write to Dept. 45-XC for complete information.

MICROWAVE COMMUNICATIONS SECTION
RADIO CORPORATION of AMERICA
ENGINEERING PRODUCTS DEPARTMENT CAMDEN, N.J.

Use Mechanization To Build Tower Line

ARCHIE L. KING
Assistant Engineer
Electric Distribution Dept
Toledo Edison Co

Mechanization, assembly of towers on the ground, and determination of construction forces to beat contractor costs and meet the construction dead-



UP GOES TOP SECTION of tower which was assembled on ground. Two linemen later went over towers and tightened bolts with impact tools

line combined to give very favorable results on a tower line construction job of Toledo Edison Co. Previously the company had used construction companies for building tower lines.

The project consisted of 12 miles of 132-kv double circuit steel tower line, which included 67 towers all 100 ft high or over. Only one circuit and the ground wire were to be installed initially.

A crew of 18 men included four technical and supervisory personnel, six linemen, two groundmen, two truck drivers, and four laborers. The group was divided into crews each doing a specialized job.

Tower footing holes were dug by a truck-mounted crane. The base section, including the tower feet, was then assembled in two sections. A second crew set the section in the footing holes.

The remaining tower was assembled in two sections on the ground with the help of a lugger type crane mounted

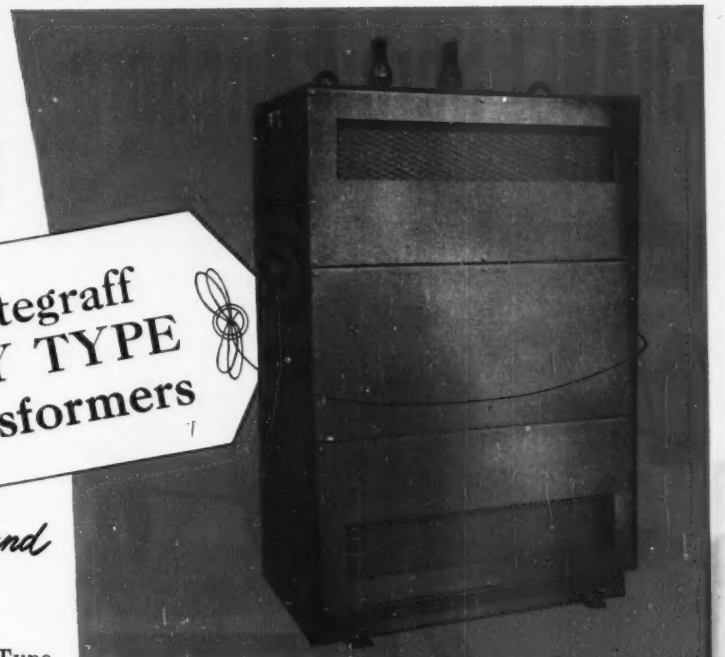
THE CONVENIENCE OF

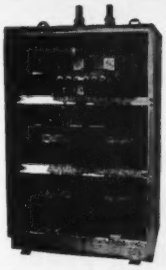
Uptegraff DRY TYPE Transformers

Saves money and Time for You!

Because Uptegraff Dry Type Transformers are safe to install anywhere and are light in weight, they do not require special rooms, enclosures, heavy foundations or floor supports. Initial cost is low, installation is relatively simple. Long, expensive bus runs are avoided because they can be located at or near the load center.

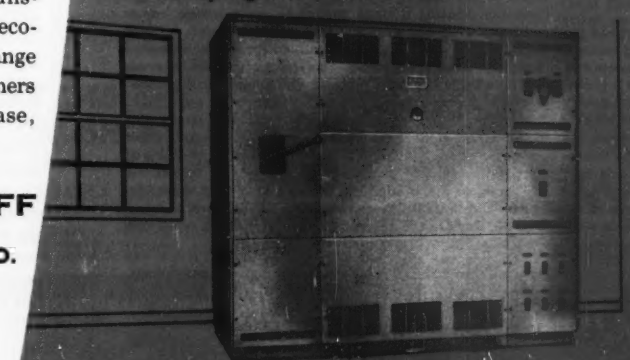
Uptegraff Dry Type Transformers are dependable and economical in service. The range of sizes includes transformers up to 2000 KVA, 3 phase, 15,000 volts.





Flexible in operation and safe for installation wherever desired, this Uptegraff Dry Type Transformer is economical and dependable. Unit shown is 333 KVA, single phase 2400/4160 Y-120 volts. Has four 2½% taps. View at left shows cover panels removed.

The Uptegraff Unit Substation



Includes transformer and switching equipment in one compact, factory-wired, unit assembly. Designed and built to individual requirements.

R. E. UPTEGRAFF MANUFACTURING CO.

Scottdale, Pennsylvania

CHANCE Screw Anchors

for easier, faster installation and greater holding power

New king size Thimbleye on the Chance No-Wrench Screw Anchor makes it adaptable for machine or hand installation. The Thimbleye opening is large enough to use a turning bar or anchor rod for hand installation and the rod head will fit adapters for hole boring machines. Machine installation saves time and man power on extended line construction jobs and makes the Chance Screw Anchor useful in areas where it is difficult to install screw anchors by hand. The single strand groove* in the Thimbleye prevents over-loading of the anchor with extra guys.

The blade of this anchor, in every size, is forged of structural steel to the exact pitch needed to take the right "bite" into the earth so that it goes down with the least possible effort and a minimum of earth disturbance. Welding of the blade to the rod, after forming, maintains this shape and retains the small rod size in the area of the blade. This keeps friction and earth disturbance to a minimum—aids installation and increases holding power.

Before you buy screw anchors, get the complete details on all types and compare these important points.

*Tripleye still available, at no extra cost, for special installations.

ABC INDUSTRIES

No Lemon—it's RIGHT when you specify CHANCE

A. B. CHANCE CO.

CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

on an army half track. The center section was then raised by a rented heavy mobile crane and bolted to the base section. The top section was raised in a similar manner and bolted to the tower. The BD and ICS towers were assembled in smaller subassemblies and required more time.

A six-man crew averaged three units a day setting the base section. An eight-man crew averaged five units a day in setting the remaining two sections. Four laborers and a foreman averaged five units a day in backfilling and tamping. Two linemen went over the completed towers and tightened all bolts with electric impact tools, averaging six towers a day. The crew was increased to 28 men for wire stringing and averaged one completed circuit mile per day.

The job was completed and energized ahead of the deadline at a substantial saving over the former method. Valuable training in steel tower construction was gained for the company's own crew.

Dampers and Armor Rod Stop Vibration Failure

G. R. Wiszneauckas
U. S. Bureau of Reclamation
Denver, Colorado

To remedy failures because of vibration fatigue, preformed armor rods have been installed at all suspension clamps, and Stockbridge vibration dampers in all spans of ground strands on a 130-mile, 115-kv transmission line of the U. S. Bureau of Reclamation. Current design as a result of the failures calls for installation of overhead ground strands with these tensions: 25% of utimate strength at −40 F in heavy loading zones; 25% of ultimate at −20 F in medium loading zones; and 25% of ultimate at 0 F in light loading zones.

In addition, standard preformed armor rods are installed on overhead ground strands at each suspension clamp. Use of two-bolt clamps to connect the pole grounding strand to the overhead ground strand has been replaced by use of a grounding clip as a means of connection. Stockbridge vibration dampers are installed in all spans 900 ft or longer.

Vibration fatigue was discovered when the overhead ground strand on USBR's Fort Peck-Williston-Garrison line had two failures during the winter

Basal spraying with Esteron 245.

Spraying cut stump to prevent resprouting.

Control brush NOW. . . by

BASAL BARK SPRAYING!

Winter has been established as a good time for basal bark treatment. This important new phase of maintenance work—spraying Esteron® 245 in oil on the basal 18 inches of brush stems or tree trunks—makes possible a 12-month spraying schedule. Basal spraying can be done *any month in the year.*

Esteron 245, which contains powerful low-volatility propylene glycol butyl ether esters of 2,4,5-T, controls most woody species. The oil carrier penetrates the bark—the chemical reaches the growing tissues, where the kill is accomplished. Esteron Brush Killer, a mixture of low-volatility propylene glycol butyl ether esters of 2,4-D and 2,4,5-T, is also highly effective. Both Esteron 245 and Esteron Brush Killer have been proved in actual use. Hand or power equipment can be used.

Both products are useful also for spraying cut stumps and brush stubs to prevent resprouting. This, too, can be done at any time during the year. The complete stump is wet to the ground line, including all exposed bark and roots. This treatment makes manual cutting effective as a brush control measure.

Dow has worked extensively over a period of many years with leading service organizations engaged in spraying right-of-ways with Dow weed, brush and grass killers. Our sales and technical men are available for consultation and assistance. Write your nearest Dow sales office.

ESTERON 245 and
ESTERON BRUSH KILLER

CONTAINING NEW LOW-VOLATILITY ESTERS

THE DOW CHEMICAL COMPANY

Agricultural Chemical Department • Midland, Michigan

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

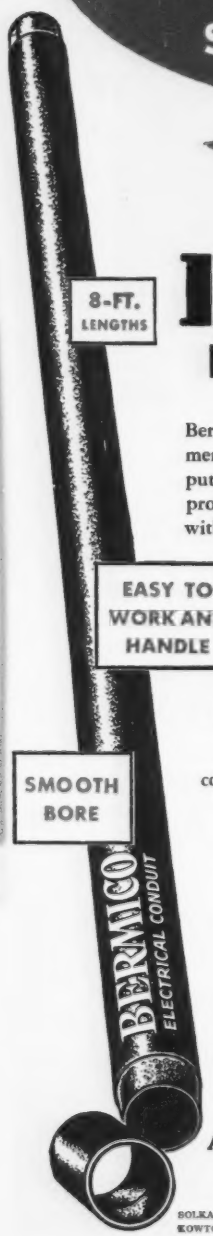
USE DEPENDABLE DOW AGRICULTURAL CHEMICAL PRODUCTS

WEED, BRUSH AND GRASS KILLERS • INSECTICIDES
FUNGICIDES • PLANT GROWTH REGULATORS
GRAIN AND SOIL FUMIGANTS • WOOD PRESERVATIVE

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY AND AGRICULTURE

FOR CONDUIT *with the* STRENGTH BUILT-IN

SPECIFY



8-FT. LENGTHS

BERMICO®
FIBRE CONDUIT!

Bermico has the strength to meet every conduit requirement – the all-around strength that only wood fibre puts into conduit! It is this tough, durable specially-processed fibre which makes Bermico better able to withstand excessive abuse and rough handling.

EASY TO WORK AND HANDLE

With Bermico you get **Easy Cable Pull.** Its unusually smooth bore prevents chafing or injury to cables being pulled through.

Bermico is **Easy to Work and Handle.** You can do cutting and tooling right on the job! Its 8-foot lengths are light . . . easy to install.

SMOOTH BORE

Bermico's **Complete Line of Bends,** plus angle couplings, enables you to meet unusual field conditions.

On your next construction job, use Bermico – the conduit with the strength built-in. It will give you extra years of trouble-free cable protection at lower cost.

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WESTINGHOUSE
Electric Supply Company
Offices in all leading cities

A PRODUCT OF BROWN *Company*
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SOLKA & CELLATE PULPS · SOLKA-FLOC · NIBROC PAPERS · NIBROC TOWELS · NIBROC KOWTOWLS · BERMICO SEWER PIPE, CONDUIT & CORES · ONCO INSOLES · CHEMICALS

Fatigue Caused Failures on Fort Peck-Williston Line

Attachments Type	Number	Number of Broken Wires
Suspension clamps	1,966	258
Two-bolt clamps	1,986	34
Dead end fittings	20	0

of 1949-50. Four of the "lay" wires of the strand broke at the two-bolt clamp connecting the overhead strand to the pole-grounding strand. The remaining three wires of the strand failed at the suspension clamp some 12 in. away.

Examination of the breaks showed that five of the lay wires had apparently failed because of vibration fatigue. Remaining lay wire and center wire had failed principally in tension.

Detailed inspections of the overhead ground strand along the length of the line revealed one or more broken wires in the strand at numerous suspension clamps. A total of 292 broken wires were found.

This line has very little sheltering from the terrain. It is located generally normal to prevailing winter winds in open flat and gently rolling range lands of northern Montana and North Dakota. Investigations confirmed that strands were installed in accordance with the manufacturers' recommendations and construction specifications. Because structural limitations would not permit restringing the strand at reduced tensions, preformed armor rods and Stockbridge dampers were installed.

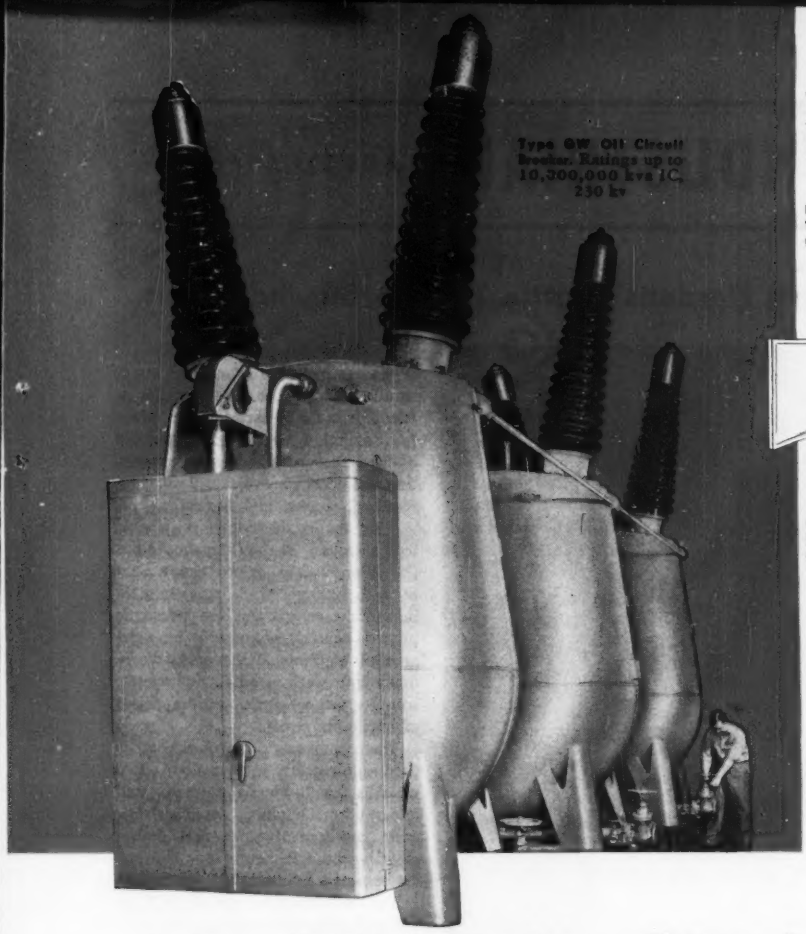
Similar overhead ground strand wire breaks have been found on USBR's Kendrick project lines, Colorado-Big Thompson, and Parker Dam power project lines. Preformed armor rods were installed at all suspension clamps to repair damage already done and to prevent further damage. Stockbridge vibration dampers have been installed only in spans 900 ft and longer.

Periodic inspections will determine how effective these measures are.

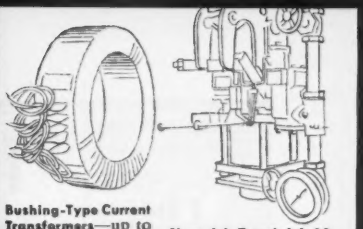
VITAL STATISTICS

Fort Peck-Williston Line

Length	129.6 miles
Ground strand	$\frac{3}{8}$-in., 7-wire, high strength steel
Catenary design	Based on NESC 5th edition
Full load tension	4,135 lb, medium loading 5,200 lb, heavy loading

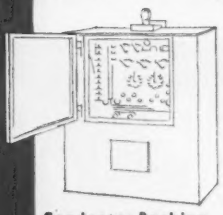


Type GW Oil Circuit Breaker. Ratings up to 10,300,000 kva I.C. 230 kv

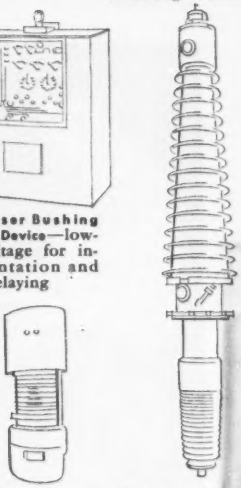


Bushing-Type Current Transformers—up to twelve per breaker

New AA-7 and AA-10 Pneumatic Mechanisms are mechanically trip-free—give 20-cycle reclosing or faster



Condenser Bushing Potential Device—low-cost voltage for instrumentation and relaying



Type O Condenser Bushings cushion and absorb electrical shocks

Type MF Multi-Flow De-Ion® Grids provide speedy, efficient arc interruption

New GW "Watchcase" Breaker

SLASHES Oil Requirements!

ANOTHER WESTINGHOUSE HIGH POWER LABORATORY DEVELOPMENT

This Type GW "Watchcase" Breaker, is another example of how Westinghouse High Power Laboratory testing creates new benefits for *you*. Look at these cost-saving features:

- Reduced oil content—roughly one-half of quantity used in conventional breakers.
- Reduced space requirements—minimum floor space and headroom.
- Reduced foundation costs—smaller size, reduced weight allow for smaller foundation.
- Reduced out-of-service time—less time to handle oil, less oil to filter, less oil handling equipment.

Retains All These Advantages of Conventional Breakers

- Insulation—clearances are as great as in cylindrical tank.
- Safety of dead tank construction.
- Bushings interchangeable with transformer bushings.
- Low-cost bushing current transformers—up to 12 per breaker.
- Low-cost bushing potential devices.

For complete information on the GW Breaker, contact your Westinghouse representative or write for Bulletin DB 33-820. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60761

YOU CAN BE SURE...IF IT'S Westinghouse

DE-ION GRID CIRCUIT BREAKERS

Induction Heating Hardens Shuttle Tips Better and Faster

Westinghouse Electric Corp

SHUTTLE TIP hardening by induction heating is speeded to 3000 per hr and floor space required is cut from 200 to 30 sq ft over old oil-fired furnace method

Radio-frequency induction heating is hardening several million textile shuttle tips per year at the Charles A. Richardson Co, West Manfield, Mass. It's doing a better job than the old oil-fired furnaces—increasing production and decreasing rejects, floor space required, smoke, and fumes.

With the r-f heating it is possible to "selective"—harden the shuttle tips (24 different sizes) at production rates of up to 3000 per hr. Selective hardening, by means of exact and automatic process control, produces a high degree of hardness at the point where maximum wear occurs and relative softness for toughness at the points of maximum stress.

The carburizing furnaces previously used required 200 sq ft of floor space whereas the 20-kw r-f generator and integral work-handling equipment require less than 30 sq ft. The equipment is completely automatic and can be operated by unskilled labor.

The work-handling equipment is arranged for manual loading, with automatic positioning, hardening, and discharge. A process timer built into the machine controls the positioning, heating, and quenching cycles.

Heating Cable Prevents Sand Discharge Freezing

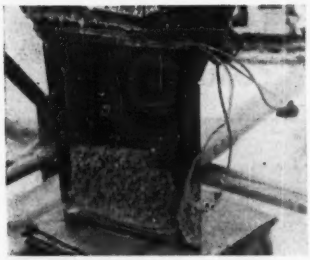
LESTER C. ROE
Commercial Industrial Dept
Atlantic City Electric Co
Atlantic City, N. J.

The cold weather trouble of sand freezing in the discharge pipes of dewatering towers has been eliminated by use of lead-covered heating cable at the George F. Pettinos Co plant in Manumuskin, N. J.

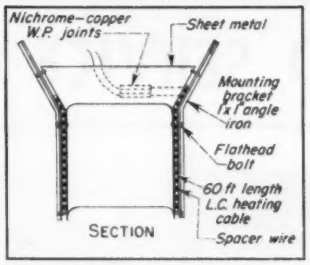
Original method of trying to keep the discharge pipes from freezing was to hang a can of oil, with a handful of waste as a wick, adjacent to the pipes, then hope the wind would be in the right direction and not blow too hard. But that method was unsatisfactory. Later a mechanic ascended the 50-ft dewatering towers with a heavy-duty blow torch for the thawing operation. This operation consumed from 0.5 to 1.5 hours on each tower before the classifiers could discharge into the dewatering towers. Of course, production was low due to these delays, not to mention the hardship of the blow-torch operator on the 50-ft tower exposed to the wind.

The plant manager enlisted the aid of the electric utility industrial representative. A jacket, utilizing lead-covered heating cable, was designed to meet the following details: (1) the two 2-in. discharge pipes must be removed from time to time for replacement, (2) the shut-off "clapper" must fit the bottom of the 2-in. pipes and operate without restriction, and (3) the lower portion of the hopper is continually splashed with sand and water.

A sheet metal form was made to fit over the two 2-in. discharge pipes and a section of the lower part of the tank. (See section drawing.) A pair of No 8 bare copper wires were wound on the form and tack-soldered in place to act as spacers between the heating cable, to increase the con-



HEATING JACKET over two 2-in. sand discharge pipes has heating cable



HEATING WIRE and spacer wire arrangement on sheet metal form, section view

ductivity and to hold the cable in place. A 60-ft length of lead-covered heating cable (420 watts, 120-v, single-phase) was then wound snugly around the form with the two sealed terminals secured at the top of the form flange. The heating cable coils were wound so that no turns would overlap or contact each other in any way as surface temperature will add and possibly melt lead sheath.

The coil covered section of the form was then wound with tape to hold the cable in place while the mounting brackets were fastened in place with flat head bolts. Next a coat of cork granules in mastic insulating material was applied (⅜ in. thick) over the outside of the whole assembly. This coat retards the heat dissipation to the air and also provides a protective weatherproof coating. Additional mounting ears are welded to the sides of the dewatering tank.

Using manual control, a switch at the classifier cpntrol board permits the operator to energize the heaters at each dewatering tower when the outside temperature drops below 28 F. Thermostats could be installed if automatic control is desired. At temperatures as low as 0 F towers have not frozen since units were installed.

Success of this application is evidenced in the fact that all the dewatering towers at the Pettinos plant are now equipped with the heaters. Also, other sand plant operators have inspected the installation and are planning similar installations.

Reflector Lamps Reduce Maintenance

HIGH BAY REFLECTOR LAMPS provide 32 ft-c average maintained intensity on working plane in the Steel Fabrication Plant of Gemco Engineering and Manufacturing Corp, Woodlawn, Ohio. The highly efficient inbuilt reflectors of these lamps materially reduce maintenance costs normally encountered in conventional high bay installations. Reflector lamps are 750-w located on 17 ft-6 in. x 20 ft centers and mounted 35 ft high. H. E. Vogel, Ind. Lighting Eng., Cincinnati Gas & Electric Co

INDUSTRIAL BRIEFS

Paint Baking in infrared oven has proved more satisfactory and more efficient than previous method of using a gas fired batch type oven at the S. K. Williams Co, Milwaukee, Wisc. The 7 ft long oven consisting of eight 3,600-w metal type radiant heaters is constructed so that a large variety of sizes are baked at maximum efficiency by adjusting the heat output of the heaters to the minimum required by means of a 30 sec percentage timer. Speed of the monorail conveyor can be varied from 0 to 6½ ft per min.

Cleaning Metal Parts in a hydrogen atmosphere of an electric furnace at the R.C.A. tube plant, Cincinnati, O., removes oxides and deposits which detergent was unable to loosen. Metal parts are made clean and bright. After first cleaning with detergent, parts are dried—then heated to 600-800 F in 38-kw hydrogen atmosphere resistance furnace of continuous flow mesh screen conveyor type having automatic temperature control. L. J. Langevin, Power Engineer, Cincinnati Gas & Electric Co.

Forming and Bonding trim and upholstery to impregnated fiber board with individual electrode type electric steam boilers at a midwestern plant provides maximum flexibility and optimum temperature for each particular job. Steam is supplied to the platens of a number of multi-platen presses. Total steam boiler load is 800 kw. Fred J. Jolly, Power Engineer, Detroit Edison Co.

Glove Drying with infrared lamps at Southern Dairies, Inc., Washington, D. C., provides platform men with dry gloves as needed for handling refrigerated products. Gloves are continuously subject to moisture absorption. The small glove drying oven, conveniently located, consists of three 250-w infrared lamps enclosed with asbestos and having an expanded metal top. Each man has three pair of gloves and dry ones are available as needed. In the summertime, 125-w lamps are substituted for the 250-w bulbs. A. C. Crawford, Power Engineer, Potomac Electric Power Co, Washington, D. C.

FREE EXHIBIT
OF FUN AND INFORMATION
MISSOURI ASSOCIATION OF PUBLIC UTILITIES
GET A YARDSTICK FREE
PLAY FREE GIVE AWAY GAME
FREE RULERS FOR THE YOUNGSTERS

GOOD PSYCHOLOGY—the word "free" appears four times on the banners at the entrance, the barker shouts it, and the folks come flocking into the tent to view the exhibit

This exhibit demonstrates many uses of electricity on the farm and in the home. For more information please fill out card provided by attendant
Electricity BOOSTS FARM PROFITS

FARM OF THE FUTURE, everything automatic and electric, gets attention from the younger set, particularly those most impatient with the unending round of farm chores

Utilities' Show Draws State Fair Visitors

HINKLE STATLER
Missouri Ass'n of Public Utilities
Jefferson City, Mo

More than 158,000 adult visitors saw the exhibit of the Missouri Association of Public Utilities at the State Fair in Sedalia last August. In a single 15-minute period, representatives of member companies, acting as hosts, greeted over 750 guests.

Housed in a gay circus tent, complete with barker, the exhibit included a modern electrified farm in miniature, a little red schoolhouse where 17,000 metal rulers and 10,000 balloons were given to children, a puppet show warning of the dangers of socialism, and a guessing game.

Prize in the game was choice between an electric and a gas range. Players entered the game by placing disks over illuminated squares on a long bench. Lettered on each square was a phrase identifying a translucent panel on a large background, each panel containing a message relevant to inflation, government competition, taxes, etc. Lights flashed on and off behind the panels, illuminating them at random. Finally only one panel remained lighted, indicating the winning square on the bench. The player at that square then could guess at the

"YOU ARE A GUEST of the Missouri Association of Public Utilities," says the line across the top of the panel board for the guessing game that teaches as it entertains

EVERYBODY WINS in the game, a yardstick anyway, ideas from the messages of the panels, and perhaps an opportunity to make a guess that might win a range

WHY VICTOR PINTYPES KEEP DISTRIBUTION COSTS DOWN

V RUGGED, THICK CROSS SECTION gives maximum strength and resistance to impact.

V LARGE RADIUS TOP AND SIDE WIRE GROOVES make hot-tieing easy and quick.

V SMOOTH CONTOUR *plus* smooth, hard glaze give unsurpassed self-cleaning characteristics—ideal for contaminated areas.

V MAXIMUM LEAKAGE DISTANCE conserves current, helps maintain rated voltage, and minimizes outages.

V EACH VICTOR LOW-VOLTAGE PINTYPE is individually inspected at every point of manufacture.

V HIGHEST QUALITY WET PROCESS PORCELAIN provides highest dielectric and physical strength.

VICTOR NO. 5 LOW-VOLTAGE PINTYPE. For complete engineering data on this insulator and other sizes and types, write today for Bulletin No. 4.

These are only a few of the reasons why VICTOR Low Voltage Pintype Insulators are famous for performance *and* economy. They last longer—give *extra* years of service—cut line maintenance costs to a minimum. Power men everywhere prefer VICTOR Pintypes!

Do You Know that...

The first wet process porcelain insulators were produced at Victor in 1893. In fact, many of our skilled craftsmen have been making high quality porcelain insulators at Victor for over 40 years.

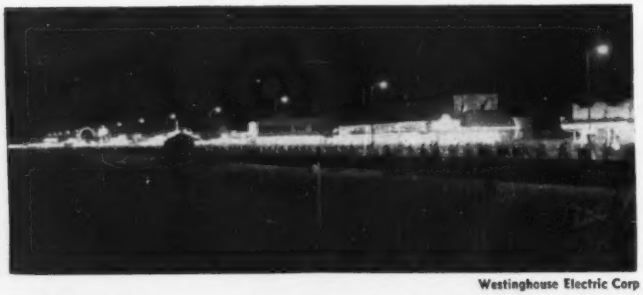
Specify

VICTOR PINTYPE INSULATORS

VICTOR INSULATORS, INC. VICTOR, N. Y.

amount of school taxes paid in 1950 by investor-owned electric, gas, and water utilities in the state in hope of winning the range. All players of the game received a yardstick imprinted with free-enterprise slogans—52,000 thus distributed.

• A "natural" in application of General Electric's 50-GA lamps has turned up in Chicago. The Stevens Hotel has installed 1800 of them in its miles of corridors. Maintenance requires only unscrewing the bulb, no fussing with shades and fixtures.



Westinghouse Electric Corp

COLOR CORRECTED mercury vapor lamps provide a half-mile ribbon of light on the boardwalk at Seaside Heights, N. J. The lamp provides red and orange tones, in addition to the usual violet, thus producing a color flattering to sun tans

Adds Glamour to Boardwalk Lighting

A new lighting system has transformed the boardwalk of Seaside Heights, N. J., an Atlantic Ocean resort, into a "White Way" flattering to sunkissed complexions. The recently installed system is reported to increase the light level 10 times over the former all-incandescent system for only 2.5 times more electric power.

Light source is the 400-w J-H1 color corrected mercury vapor lamp recently developed by Westinghouse. This lamp provides a warmer color of light than other mercury lamps, by blending the blue-white color of mercury light with the orange-red of incandescent light.

The installation consists of 24 lamps mounted 30 ft above the boardwalk. The lamps are in football-shaped overhanging fixtures atop aluminum standards 125 ft apart. By this system a half-mile-long ribbon of light carpets the boardwalk and also the beach and shoreline 100 yards away.

• Television sales appear to be emerging from the quagmire of buyer reluctance, heavy inventories, and price cutting, getting onto firmer ground. Higher prices are in the offing—Sylvania announces $10 to $20 increases on its new line—and distributors are regaining confidence according to a Belmont Radio release which says that orders for new Raytheon sets are ahead of anticipated quotas.

• Acting on the fact that the power company employee with a gas range in his kitchen is a poor advertisement for electric cooking, New Jersey Power & Light made it very easy for its people to buy electric ranges. For 3 weeks, November 13-30, Philco ranges were offered to employees at discounts up to 49% and with wiring allowances up to $45.

• The $4,000,000 Seattle program to improve the street lighting system calls for the installation of mercury-vapor lights along every arterial street in the city. Owners of homes along three blocks of an arterial in the Magnolia Bluff district, swankiest in the city, objected. The bright lights along the streets in front of their homes would be "detrimental to home life," they argued, and were not needed for traffic safety. The city council turned them down, pointing out that general traffic safety needs have priority over the wishes of home-owners.

• To the local public the man who manages the electric league or association is the natural spokesman for the industry. Because of his position people will pay attention to what he says, giving him credit for disinterestedness because he represents the whole industry, not just any part of it. Realizing this, Glen L. Logan, managing director of the Electric League of Los Angeles, had no trouble landing about 30 column inches in a local newspaper on the subject of television servicing. The theme of the article was that the honest service men vastly outnumber the gyps and that the television buyer can protect himself by reading the contract and not trying to get something for nothing.

Chicago Ass'n Launches Electric Blanket Campaign

Thirty-eight thousand electric blankets have already been sold in the second annual campaign sponsored during the Christmas selling period by the Chicago Electric Association. Backed by an intensive consumer advertising campaign, the activity will have more than 500 dealers participating.

Campaign material features two slogans: "Four million people sleep under electric blankets. Why don't you?" and "For the rest of your life . . . an electric blanket." Ads tell the consumer that people in all walks of life sleep electrically and electric blankets are Christmas gifts sure to be appreciated.

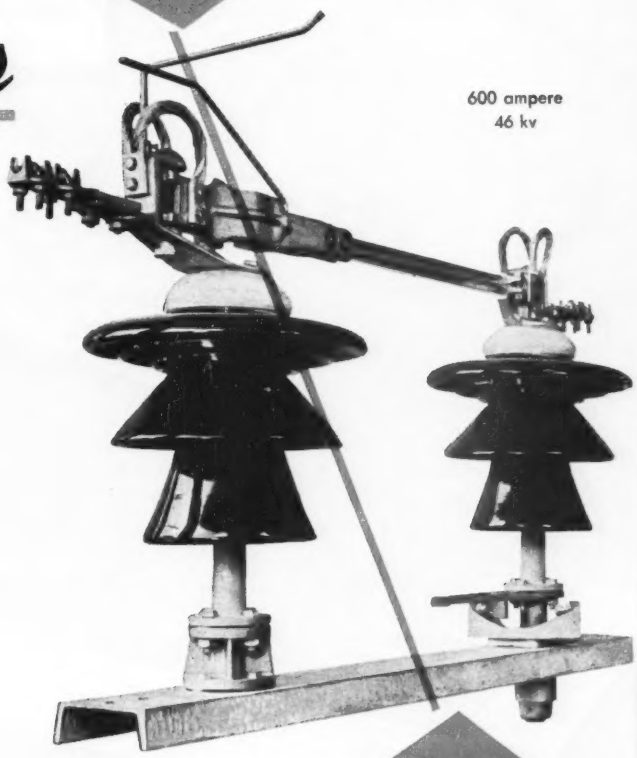
Dealer tie-ins include point of sale aids, easel cards for window and counter display, streamers, a portfolio of ad proofs and a folder on "Things to Know About Electric Blankets." Dealer sales promotion men from Commonwealth Edison delivered materials to participating dealers and helped plan window and floor displays. Public Service Co of Northern Illinois is cooperating in eight key towns and cities.

Focal point of the activity is the Electric Blanket Institute at Commonwealth Edison's downtown sales room. Each manufacturer furnished a display at the Institute and the Chicago Electric Association made an educational exhibit on the development of the electric blanket and its common use for the controlled warmth of electrical sleeping in today's modern living.

HIGH PRESSURE

Contacts that never get tired!

Southern States
Type 57-HP
Side Break Switch



600 ampere
46 kv

There are tough years ahead for the air break switch you install today; and the stiffest punishment will be heaped on the heart of the switch . . . THE CONTACTS!

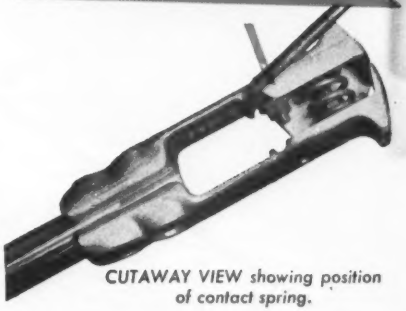
That's why durability is built right into the high pressure line contacts on Southern States' Type 57-HP. They take rated fault currents, carry rated load continuously, withstand thousands of operations and still perform satisfactorily after years in the field.

The ageless quality in these contacts comes from a precompressed, stainless steel spring positioned between contact members as illustrated. Liberal contact deflection assures long life as it precludes reduction of contact pressure resulting from contact wear or maladjustment of switch controls.

The 57-HP is available from 7.5 kv to 69 kv and in current ratings of 400, 600, 1200 amperes.

• FUR FULL INFORMATION WRITE FOR BULLETIN NO. 365-HP

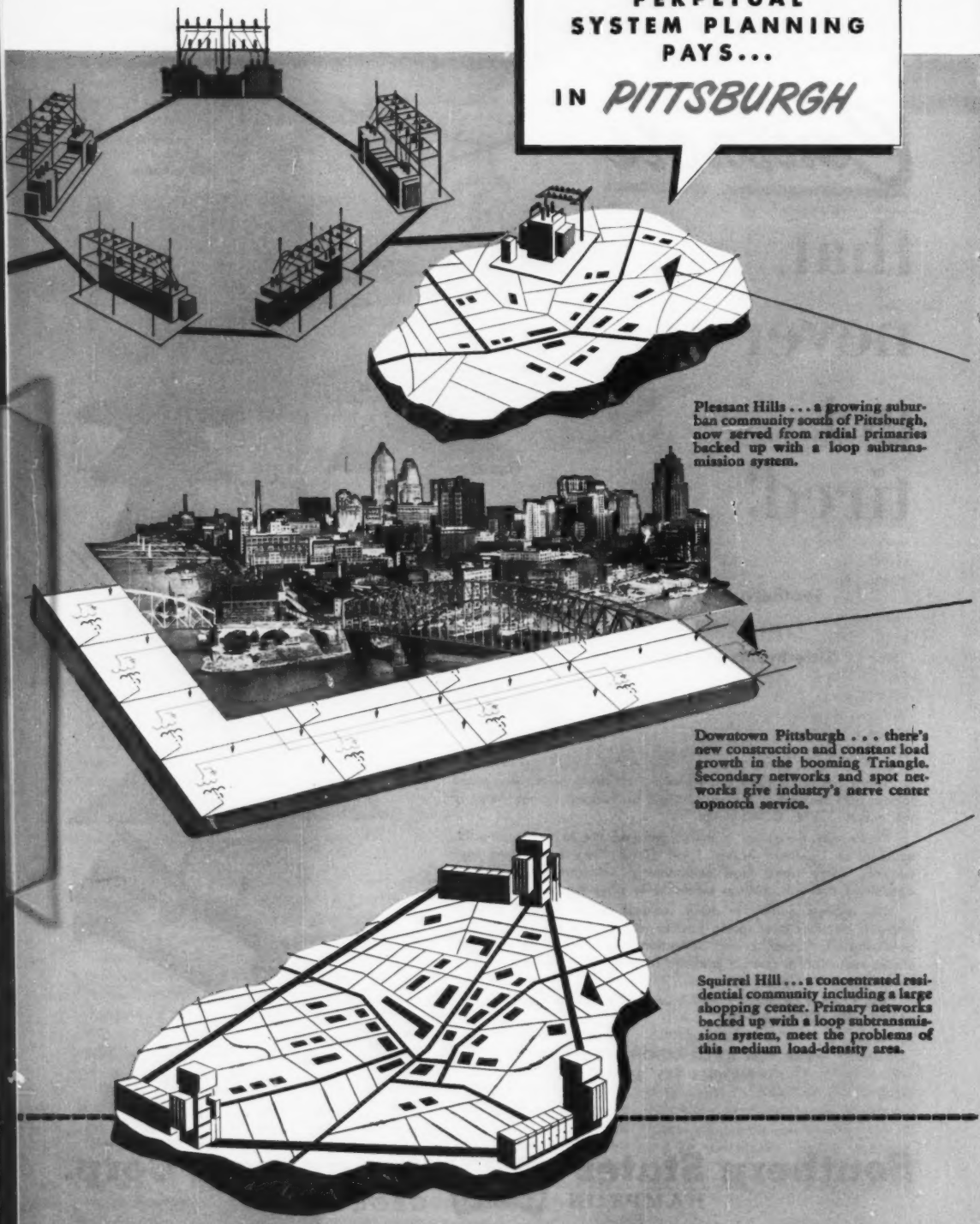
POSITIVE CONTACT



CUTAWAY VIEW showing position of contact spring.

Southern States Equipment Corp.
HAMPTON GEORGIA

PERPETUAL SYSTEM PLANNING PAYS... IN *PITTSBURGH*



Plessant Hills . . . a growing suburban community south of Pittsburgh, now served from radial primaries backed up with a loop subtransmission system.

Dowatown Pittsburgh . . . there's new construction and constant load growth in the booming Triangle. Secondary networks and spot networks give industry's nerve center topnotch service.

Squirrel Hill . . . a concentrated residential community including a large shopping center. Primary networks backed up with a loop subtransmission system, meet the problems of this medium load-density area.

"Simplified Systems

meet our load growth...
reduce distribution costs"

In Pittsburgh you'll find all the benefits from almost 30 years of sound system planning. Main benefit—complete flexibility to meet all load growth economically.

Duquesne Light Company take full advantage of the latest advances in the design and reliability of modern unitized electrical apparatus. Small blocks of power are integrated to improve their own unique Service Continuity Standards without uprooting the entire system.

CASE I Greatly increased load with subsequent voltage problems necessitated improved service continuity and the elimination of line losses for this suburban area. Proper system planning utilized a nearby subtransmission loop by installing a unit-type single-feeder substation. Pleasant Hills gets adequate service and costly field-erected substations are eliminated.

CASE II Secondary networks have provided Pittsburgh's Triangle with the highest quality of service since 1926. Badly congested primary feeders and small transformer installations were eliminated. Duquesne Light Company also offers the spot network form of the system for large commercial buildings. Sound planning enabled Pittsburgh to grow without any basic changes in the system.

CASE III 4 kv primary networks were installed in 1949 to economically meet the Service Continuity Standards for this medium load-density area. Careful planning based on load growth, income potential and geographic conditions dictated the necessity for a primary network system. Now, service continuity is high and there's complete flexibility to meet any increase or change in load density.

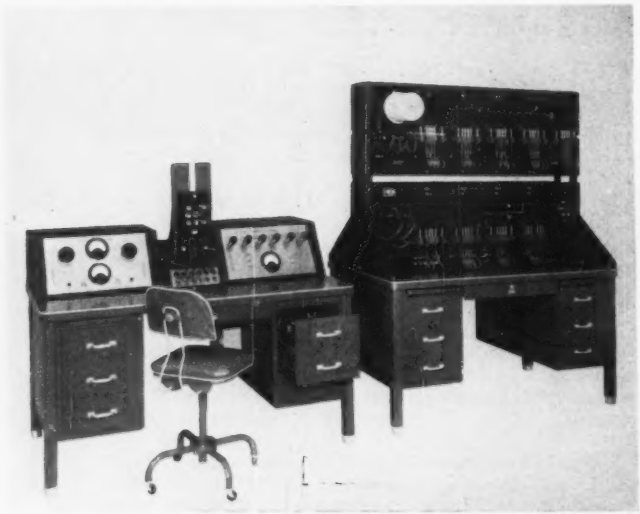
BECAUSE OF SOUND PLANNING, systems have been simplified, small blocks of power integrated, high service standards maintained, power distribution costs reduced. Westinghouse equipment and co-ordinated distribution apparatus have contributed to the ease and speed of change-over, dependability, and economy of this model operation. Use Westinghouse as your planning partner. Call us when you're ready to modernize. Start modern planning now!

J-97154

YOU CAN BE SURE... IF IT'S
Westinghouse
SYSTEM PLANNING SERVICE

NEW EQUIPMENT

Thermal Demand Meter Control and Meter Rack Tables



This new Thermal Demand Meter Testing combination was designed so that the number of demand meters that may be tested on the rack table is dependent only on the current capacity desired.

Using two regulators it is possible to bring current and potential into unity power factor for any quantity or capacity of meter under test. The loading regulator permits adjustment from zero primary voltage on the loading transformer to full source voltage. All controls are within easy reach.

The manufacturer reports that it is possible to utilize part of the rack for heat runs under potential while the remainder of the rack is being used for test purposes.

Phasing and loading regulators provide control of varying conditions.

The States Co, 3 New Park Ave, Hartford, Conn.

Metal-Clad Switchgear Line

A new standard line of metal-clad switchgear, ranging in ratings from 2400 to 13,800 volts, 150 to 500 Mva, has been announced by G. E.

Significant features of the new equipment include: Magne-blast breaker, in which a maximum number of parts are interchangeable among breakers of different ratings.

Another feature is an electro-mechanical control device built integral with the breaker mechanism. Auxiliary switches for non-control functions are mounted on the stationary structure of the gear.

A new insulating material having excellent flame-retardant, dielectric and anti-hygroscopic properties is used throughout the breaker. Its use reportedly serves to localize damage which may occur if abnormal conditions—such as lightning surges from inadequately protected lines, subjection to short circuit duty in excess of rating, or mechanical damage from external causes—produce breakdowns.

Another design improvement simplifies the breaker elevating mechanisms.

All elevating mechanisms are driven by a motor, which is demountable for hand crank operation, and is controlled by a safety interlocked control system.

Cable entrance facilities are interchangeable from top to bottom entry. Directions of entry need not be determined prior to delivery.

General Electric Co, Schenectady.

HAPCO ALUMINUM ALLOY LIGHTING BRACKETS

TAPERED STYLE

The Hapco Tapered Style Bracket, of permanent, lightweight aluminum alloy, is gracefully tapered from a 2½ by 5-inch oval at the pole end to 1¼-inch standard pipe size at the luminaire end. The graceful upsweep provides a rise of 17-inches from the center of the pole mounting end to the outer end. The unique design gives considerably greater strength than 2-inch pipe of the same material. Note that the four foot size weighs only seven pounds ready for shipment.

The high strength aluminum alloy Pole Plate is welded to the arm to form a solid unit, and the exclusive Hubbard Keyhole Mounting Slot makes one-man mounting easy. Internal wiring is provided for by a slot in the bottom of the arm near the Pole Plate.

Standard numbers listed below are supplied with outer end reduced to 1¼-inch pipe size for slip-fitter luminaires or 1¼-inch standard pipe threaded fittings. If 2-inch pipe end is desired, please specify.

Stock No.		Nominal Length of Arm—Feet	Approximate Shipping Wt. Lbs., Each
Threaded End	Plain End		
HAL 4224	HAL 4224P	4	7.0
HAL 4225	HAL 4225P	5	8.5
HAL 4226	HAL 4226P	6	10.0
HAL 4228	HAL 4228P	8	14.5

HUBBARD ALUMINUM PRODUCTS COMPANY

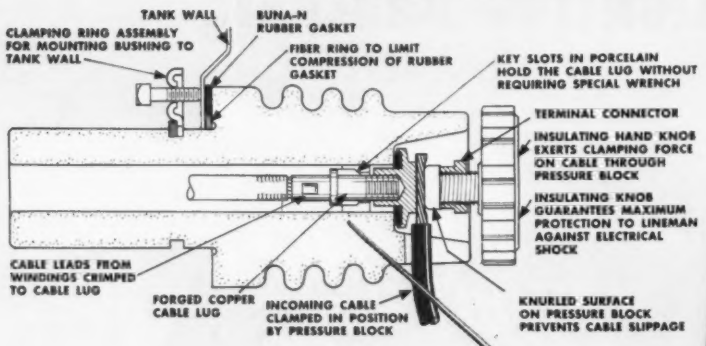
MANUFACTURER OF HAPCO QUALITY ALUMINUM PRODUCTS

A Division of HUBBARD and COMPANY

6301 Butler Street • Pittsburgh 1, Pa.

"Our New POLE STAR HIGH VOLTAGE BUSHING has every Mechanical and Electrical Feature desired by Utility Engineers and Operating Men"

says **W. A. MOCKER,** *Planning Engineer,*
PENNSYLVANIA TRANSFORMER COMPANY


TANK WALL
BUNA-N RUBBER GASKET
CLAMPING RING ASSEMBLY FOR MOUNTING BUSHING TO TANK WALL
FIBER RING TO LIMIT COMPRESSION OF RUBBER GASKET
KEY SLOTS IN PORCELAIN HOLD THE CABLE LUG WITHOUT REQUIRING SPECIAL WRENCH
TERMINAL CONNECTOR
INSULATING HAND KNOB EXERTS CLAMPING FORCE ON CABLE THROUGH PRESSURE BLOCK
INSULATING KNOB GUARANTEES MAXIMUM PROTECTION TO LINEMAN AGAINST ELECTRICAL SHOCK
CABLE LEADS FROM WINDINGS CRIMPED TO CABLE LUG
FORGED COPPER CABLE LUG
INCOMING CABLE CLAMPED IN POSITION BY PRESSURE BLOCK
KNURLED SURFACE ON PRESSURE BLOCK PREVENTS CABLE SLIPPAGE

Pennsylvania Transformer Company, pioneer of the straight, sidewall high voltage bushing for distribution transformers, has re-designed its high voltage bushing and is now installing it on all Pole Star transformers requiring sidewall bushings.

ELECTRICALLY CO-ORDINATED

The Basic Impulse Level of the bushing is co-ordinated with the transformer windings. When the transformer is subjected to a voltage surge above the BIL of the bushing, the bushing will flashover on the outside. A separate, completely co-ordinated bushing is available for each voltage class—5 Kv and 8.6 Kv.

MECHANICALLY IMPROVED

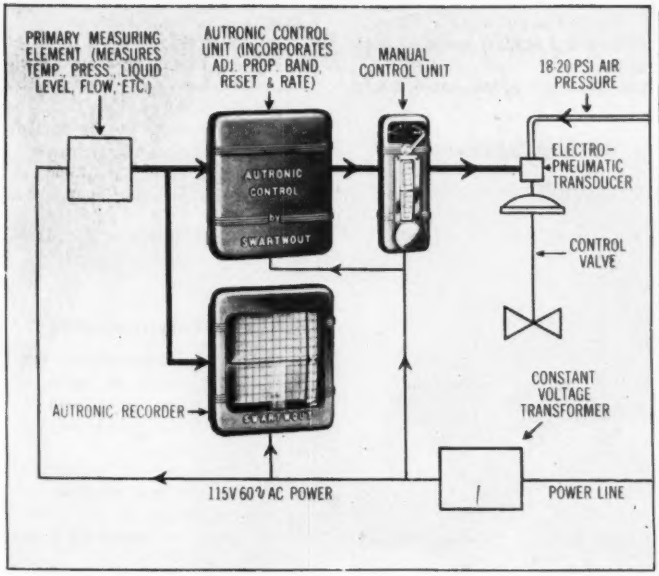
The new Pole Star bushing is extra strong and extra safe. No tools are needed to make a line connection. *You simply insert the incoming cable through the side opening and turn the handle.* This tightens the pressure block against the cable and holds the cable in a vice-like grip to make an excellent electrical and mechanical connection. The corrugated, easy-to-grip knob is constructed of a phenolic rubber compound and will not break to expose live parts, or chip to cut a lineman's glove.

Let the POLE Star be your guide

Product Of Long Experience — Safe Thrifty And Reliable

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. • ***Greater Pittsburgh District***


PRIMARY MEASURING ELEMENT (MEASURES TEMP., PRESS., LIQUID LEVEL, FLOW, ETC.)
AUTRONIC CONTROL UNIT (INCORPORATES ADJ. PROP. BAND, RESET & RATE)
MANUAL CONTROL UNIT
18-20 PSI AIR PRESSURE
AUTRONIC CONTROL by SWARTHOUT
ELECTRO-PNEUMATIC TRANSDUCER
CONTROL VALVE
CONSTANT VOLTAGE TRANSFORMER
AUTRONIC RECORDER
115V 60~ AC POWER
POWER LINE

Instrumentation and Control System

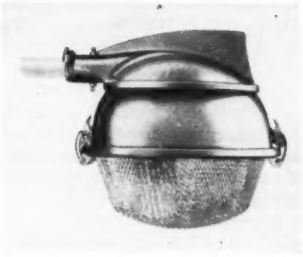
The Autronic control system for use in industrial power plants and central stations consists of three basic units: Primary sensing element, Autronic control unit, and final control unit.

The primary sensing element generates a voltage which is directly proportional to any change in the process variable. This voltage is transmitted to the Autronic control where it is continuously modulated electronically. The control then transmits the resulting direct current to the final control element which may be either electrically or pneumatically operated.

If a graphic presentation of the process is desired, an Autronic recorder may be used. The system may also include a manual controller which permits switching from automatic to manual control.

Indication of valve position is given at all times.

The Swarthwout Co, 18511 Euclid Ave, Cleveland 12, Ohio.



Luminaire

The new L-M Ovalite luminaire is designed primarily to utilize the complete range of mercury vapor lamps in the horizontal burning postion. It will also take incandescent lamps up to and including 800 watts on multiple circuits and 15,000 lumens on series street lighting circuits.

The low surface brightness is achieved by locating the light center approximately 3-in. above bottom edge of reflector element and the use of elevating prisms in the enclosing refractor.

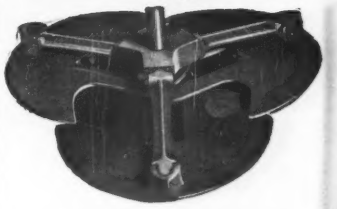
The rectangular shaped Alzak reflector reportedly provides an asymmetric light distribution giving high utilization efficiency on roads and sidewalk areas. Prisms on the refractor house side redirect the light toward the street area.

The Ovalite luminaire will accommodate AH-5, 11,000 lumen; AH-1, 15,000 lumen; or the EH-1, 20,000 lumen mercury vapor lamps in a horizontal position. Magnetic arc control is required when operating AH-1 lamps and is available as optional equipment for improved efficiency with the type EH-1 lamp.

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all others. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO.
Manufacturer of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

Crapo
GALVANIZED STEEL
STRAND

Combines All Four

EVERY requisite that sound construction needs demand are combined in *Crapo* Galvanized Steel Strand—

1. High strength
2. Ruggedness
3. Long life
4. Economy

The superior tensile strength inherent in steel is utilized to fullest advantage in each size and grade of this time-proved strand. The heavy, ductile, tightly-adherent galvanized coating—applied by the famous *Crapo* process—provides dependable protection to the steel, extends the life of the strand beyond the normal period of replacement.

Specify *Crapo* Galvanized Steel Strand for guys, messenger and overhead ground wires! There is a size and grade for every practical need available for prompt shipment.

ASK YOUR JOBBER!

Consult your nearest distributor of *Crapo* Products or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE INDIANA

The Ovalite luminaire is offered for slipfitter and pendant mounting in 1¼ or 2-in. sizes.

Line Material Co, Milwaukee 1, Wisc.

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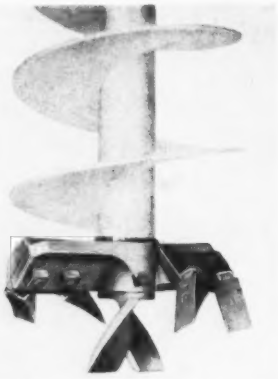

Earth Auger Cutting Head

A new unit of twin helix design replaces the conventional cutting head direct welded to the bottom of any continuous helix auger. The PENGO Cutting Head is said to work favorably under any kind of ground conditions, but its main features are that it makes it possible to bore holes under adverse conditions with machines using the continuous helix auger, where formerly only heavier type machines were capable of boring.

All PENGO Cutting Head parts are standard and are interchangeable with the standard PENGO Earth Auger of the same size, including shank plates, replaceable points, and fishtail pilot bits.

Petersen Engineering Co, Santa Clara, California

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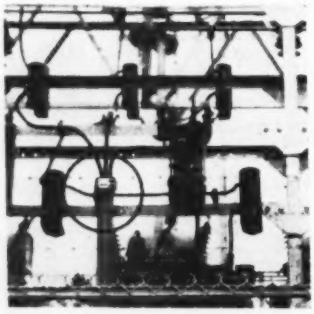


Cable Support-Conduit Seal

A new type of cable support and conduit seal, the Wedge-lock Supports, is shown supporting cables on a 23,000 volt bus structure.

Compound filling prevents water following down the cable into the conduits.

Fittings have wedge inserts tapered to lock into place as strain increases.

For outdoor use the fitting is equipped with an aluminum alloy body.

Adalet Manufacturing Co, 14300 Lorain Ave, Cleveland 11, Ohio.

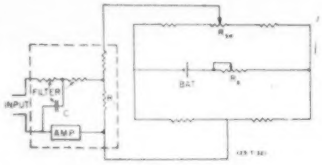
•

Low Level Potentiometer

A new potentiometer circuit that permits measurements of spans as narrow as 100 microvolts has been developed by Minneapolis-Honeywell Regulator Company.

The new narrow span instruments can reportedly be used wherever accurate measurements of d-c potentials of the order of microvolts is required.

In addition to direct voltage determinations, as encountered in many scientific, technical and electronic investigations, the instruments are reported useful (with appropriate primary measuring elements) for the



precise measurement of differential temperatures, and the accurate determination of slight variations in the temperatures of small objects through the use of radiation pyometry. Additional applications embracing other variables reducible to dc potentials also exist where the high resolution obtainable with narrow span instruments facilitates precise measurement.

Minneapolis-Honeywell Regulator Co, Minneapolis, Minn.

•

Mercury Thyratron

The newly developed Sheldon MT-1530 Mercury Thyratron has been designed to control extremely high dc voltages and current.

Peak anode voltage is 15,000 volts forward or 15,000 volts inverse, maximum peak plate current 100 amp.

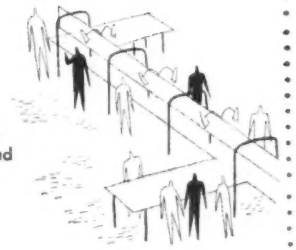
According to the announcement, this tube will operate under load con-

the truth about Dow Corning Silicones...

. . . is more fantastic than the patter of the pitchman or the spiel of the barkers that doubled in advertising and sales a generation ago. For example:

- **Silicone (Class H) electrical insulation makes motors and other kinds of electrical equipment last 10 times as long as they ever did before.**
- **These same insulating materials are used to double the power per pound ratio in electric machines.**
- **Silastic,* the Dow Corning silicone rubber is used to seal hot air at 600°F., hot oil at 350-400°F., limit switches and bomb bay doors at —100°F.**
- **Dow Corning Silicone oils and greases make permanent lubrication a practical reality.**

To many engineers and executives, such silicone facts as these still sound too good to be true. That's why we have built and assembled 16,000 pounds of demonstration units and typical applications to prove that our silicone products will do all that we claim for them. This is the first comprehensive Silicone Exposition ever assembled. Previewed in Washington, D. C. during the week of October 22nd, this exhibit will be given private showings in major industrial centers across the country.



DOW CORNING SILICONE EXPOSITION
now scheduled for

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DETROIT
PHILADELPHIA
NEW YORK
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If you want to know more about this Exposition write for complete information including our new 32-page book which answers in simple words and pictures, the $64 question, "**What's a Silicone?**" Address Department **AY-12**

DOW CORNING CORPORATION
Midland, Michigan

ATLANTA
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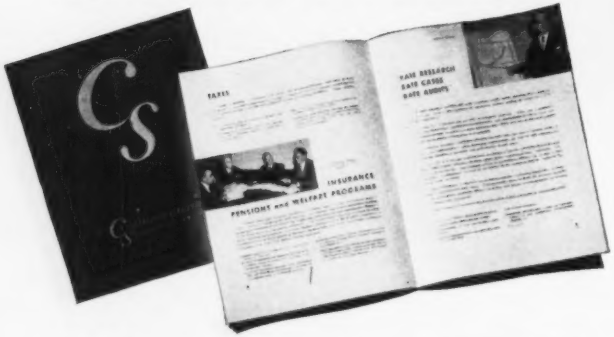
*T.M.REG.U.S.PAT.OFF.

DOW CORNING CORPORATION MIDLAND, MICHIGAN

NEW YORK
WASHINGTON, D. C.

In CANADA: Fiberglas Canada, Ltd., Toronto • In GREAT BRITAIN: Midland Silicones, Ltd., London

THE TOUGHER THE JOB
THE MORE WE CAN HELP



An outside viewpoint is often essential in a search for new ways of cost reduction, methods, management, organizational, or engineering problems.

Commonwealth specialists have a sound background in the various aspects of business operations. Valuable time of your executives may be saved by calling Commonwealth in on the job.

No matter whether the job is large or small, Commonwealth's ability may profit you.

Check the ways in which Commonwealth can contribute to the efficiency and economy of your organization. Write for booklet describing the many services available to you. Address: Commonwealth Services Inc., Department 43, 20 Pine Street, New York 5, N. Y.

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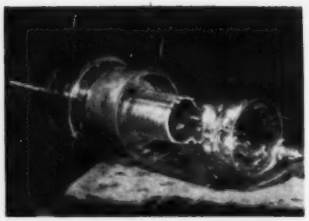
ABILITY · EXPERIENCE · RESOURCEFULNESS · RESULTS

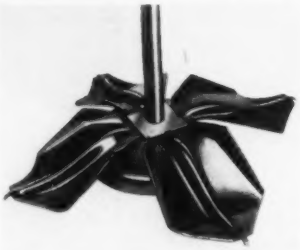


ditions that mechanical switches could not possibly stand up under.
Sheldon Electric Co, Irvington, N. J.

•

Expanding Earth Anchor

This new anchor, designed for power transmission and distribution lines, is 10 inches in diameter and has a projected area of 200 sq. in. expanded with nominal holding power



classification of 20,000 lb.

All the features of the present 2-way and 4-way anchors are incorporated.
Pieper-Lillard, Inc, St. Louis 22, Mo.

•

Air-powered Hand Pruning Saw

Operating at 1500 strokes per minute this new lightweight air-powered hand pruning saw has cutting capacity to 6 inches.

Any self-contained air source or power take-off with capacities from 8 to 30 cfm, depending upon units supplied, can be used as a source

"Regarding the future, copper just will not be available. If you want to string lines, install buses, or run loops, it will pay you to investigate every possible use for aluminum wire—covered and bare."*

BUT DEAD-ENDING ALUMINUM CONDUCTORS EFFICIENTLY AND ECONOMICALLY TO ASSURE MAXIMUM LIFE REQUIRES A NEW TYPE OF DEAD-END.

Preformed Line Products Company shows the way again with the PREFORMED "ALUMINUM CONDUCTOR" DEAD-END pictured above.

For the details of its exclusive advantages write on your letterhead or . . .

TELEPHONE CLEVELAND: EXpress 1-3571

*From the remarks made by a spokesman of Defense Electric Power Administration before the Transmission and Distribution Committee of Edison Electric Institute at a recent meeting.

PLP

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO

"Line faults quickly, accurately located with G-E oscillographs,"

reports

Niagara Mohawk

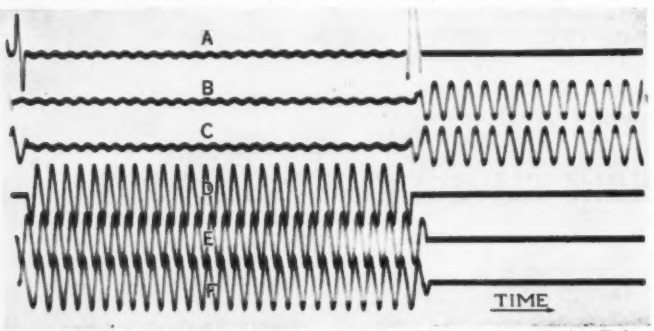
Saves manpower—automatically records faults

Niagara Mohawk Power Corporation reports its Type PM-13 automatic oscillographs are saving many valuable man-hours by accurately locating line faults. For instance, when oscillographs are installed at each end of a transmission line, faults can be located to within a few towers . . . and on many occasions to the exact tower. Maximum benefit comes when a PM-13 is located on each end of a transmission line or spur.

SPOTS FAULTS QUICKLY—Faults are quickly located for correction. Minor faults can also be detected before they cause major damage, thus preventing future outages.

REQUIRES NO OPERATOR—PM-13 starts fast (in 1/240 second), records entire disturbance time, and stops after fault has been cleared. This oscillograph can be tripped by a change in either potential or current, so it can be used at an unattended station. Makes as many as 100 oscillograms without intermediate attention.

For more information, call your G-E representative or write for Bulletin GEC-396. General Electric Company, Schenectady 5, New York.



CLEAR RECORD of 3-phase-to-neutral short circuit—system frequency, 60 cycles. Record shows (A) current in neutral; (B) line voltage (1-2); (C) line voltage (2-3); (D) line current (1); (E) line current (2); and (F) line current (3).

GENERAL ELECTRIC

602-209

of supplying power.

Saw weighs only 5½ lb. Standard length is 36 in. but several lengths are available. Several types of blades are available for various types of work. **Miller-Robinson Co, Los Angeles, Calif.**

MORE NEW PRODUCTS
about which you should know

Steber Mfg Co, Broadview, Illinois, has developed a **brooder fixture** that accommodates three 250-w infrared heat lamps. Heat resistant sockets are mounted in a 16 in. hood. Hood is equipped with hanger holes for easy suspension, and heat pattern is ample to foster a brood of 250 chicks.

Edwin L. Wiegand Co, 7513 Thomas Blvd, Pittsburgh 8, Pa., announces new **Chromatrolled laboratory hot plate.** Models rated between 660 and 2000 w, 120/240 v can maintain surface temperatures up to 800 F to meet laboratory requirement. Safety of totally enclosed resistor wires and cool handling are features. . . . Air-Line Engineering Co, 4758 Warner Rd, Cleveland, Ohio, offers a new **compressed air line filter** which functions as a condenser and is used to remove water and oil from air lines. Expansion of the air and extensive cooling surface condenses moisture from air. Fiberglas baffles eliminate remainder.

Clipper Mfg Co, Kansas City 8, Mo., has developed a **concrete-cutting diamond blade,** making it possible to actually saw patches, trenches, or contraction joints in floors or streets. . . . . Curtis Lighting, Inc, 6135 W 65 St, Chicago 38, Ill., recently announced 8-ft "Challenger" lighting units designed to provide economical, quality lighting for industrial locations.

Metron Instrument Co, 432 Lincoln St, Denver 9, Col., announces new 0.025 hp **miniature variable-speed drive** with push rod control for use in timers, recorders, etc. . . . . Alpha Corp of Greenwich, Conn., has developed a **lubricant** of smooth texture molybdenum-disulfide powder called Molykote with ability to prevent galling and seizing at bearing pressures well over 100,000 psi.

ROCKBESTOS PNR®

HELPS YOU EXTEND YOUR STEEL CONDUIT ALLOTMENT

25% MORE

Ordinary 7-conductor competitive cable, #9 AWG takes 1¼" conduit. 228 Lbs. of steel/100.'

PNR 7-conductor cable #9 AWG takes 1" conduit. 168 Lbs. of steel/100'. You save 60 lbs.

Approximately ½ the size of competitive control cable, Rockbestos PNR helps to provide the solution to your critical steel requirements. It enables you to use smaller conduit and fittings, thus providing substantial steel savings; or you can put 12-conductor cable in conduit carrying 6 or 7.

Here's the Rockbestos construction that makes PNR a better control cable... Polyethylene for high dielectric strength — Nylon for toughness and abrasion resistance — Rockhide for high resistance to weather, chemicals and abuse.

Get the PNR story, today. Write or ask your nearest Rockbestos representative.

QUICK FACTS ABOUT PNR

- 46% smaller area* . . . 28% smaller diameters*. Use smaller conduit and fittings or put more conductors in present conduit.
- Dielectric breakdown...over 40 times operating voltage.
- Lighter and smaller. Easier to handle, store, ship, pull through conduit.
- Flexible to —25°C (—13°F). No cracking!
- Rated 600 volts . . . conductor operating temperature 75°C (168°F).

*Average determined by comparison with competitive control cable.

ROCKBESTOS PNR®

... another different, better cable by

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.

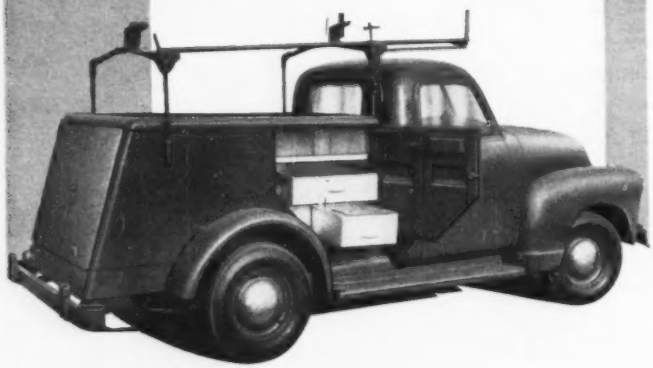
the originators of **A.V.C.®**

New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
Los Angeles • Oakland, California • New Orleans • Seattle

YORK-HOOVER

MODEL 201U76

new LIGHT DUTY SERVICE INSTALLATION BODY



WHAT THE MODEL 201U76 BODY WILL DO FOR YOU...

Light duty service work must be fast and efficient. Materials and tools must be readily accessible. That is why the new York-Hoover Model 201U76 Body was designed . . . especially for **your** light duty service work . . . for **your** convenience . . . for **quicker, better service.** Efficient design and sturdy construction, combine to provide this **faster, better service** for you . . . at **less** cost.

Write us today regarding your light duty service problems. We will be glad to provide you with all the details, including earliest possible delivery dates of the Model 201U76.

Bulletin No. 930 contains all the facts about our Model 201U76 Body. Write for your copy today!

York-Hoover Corporation
YORK, PENNSYLVANIA
Body Division

WHAT THEY'RE SAYING
at industry meetings

Copper and Aluminum Supplies

H. W. Biskeborn, *technical director, Kaiser Aluminum Co, before Cleveland General Meeting of AIEE*

As the supply of copper is not inexhaustible, the electrical industry may face the need of finding suitable substitutes. The factors of price and availability are causing the metal consuming industries to revise their viewpoints on production methods and choice of raw materials. For the electrical industry, the economic factor of aluminum is of the greatest importance because of the inevitable trend of the cost of copper.

Aluminum production is now 1,437 million pounds, with an expected increase to 3,500 million pounds by 1953. However, there is a current shortage, and military needs may absorb this additional production. An additional load on aluminum production resources will be brought about by the electrical industry, as it is now consuming 50% of the primary copper for wire and cable, and aluminum is the only possible substitute for copper.

Industry, particularly the electrical industry, must accelerate planning for copper substitution, as copper is not inexhaustible and must be used with more economy.

Problems of Aluminum Conductors

Henry Dupre, *Burndy Engineering Co, before the AIEE Cleveland General Meeting*

Because of the increased shortage of copper for electrical conductors, the use of aluminum is rapidly increasing. This use has been applied to overhead conductors for some time, and now is being extended to underground distribution and insulated conductors in buildings.

This more extended use of aluminum conductors is forcing consideration of many factors such as:

1. Electro-galvanic action where aluminum conductors are connected to existing copper conductors.

2. Designing and redesigning connectors for use on aluminum conductors.

3. Vault space for use with copper conductors in building construction.

4. Re-education of cable splicers, especially where workmen are less skilled than power company lineman.

5. Need for Underwriters Laboratories' listings, and review of old tests and addition of new ones.

Once all of these factors have been considered the problem of designing a fitting for use on aluminum is no more a problem than the designing of a fitting for copper.

Appliance Servicing

H. E. Putnam, *Customer Service Manager, Landers Frary & Clark, at conference of International Association of Electrical Leagues, New Orleans, La.*

At least 20% of all returns of electric housewares for service could be eliminated if the dealer would give simple instructions to the consumer in the operation and care of the appliance at the time of sale. The average dealer in his enthusiasm to sell overlooks the headaches he could save himself and the good-will he could create by doing so. I say to the dealer—don't be just an order taker. Spend that extra 15 minutes on the electric housewares sale in giving your customer the full story.

Engineers

Herbert Hoover *at the dinner launching the drive for the new Columbia University Engineering Center*

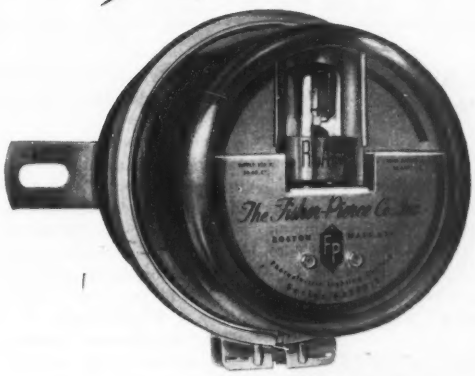
Many people are not aware of the fact that engineers are both a political as well as an economic social force. He is the fellow that dissolves monopolies, redistributes wealth, and dismantles political platforms.

The engineer distributes wealth by creation of mass production and his many other devices which have reduced production costs. He brings the prices of thousands of gadgets to the level of every one's pocketbook.

The training of engineers instills character in those who join the ranks. High ethical standards are necessary in engineering, as they are in all professions. Without intellectual honesty, technology does not work. Construction without consciousness soon crumbles. These are the reasons you saw no engineers before the Kefauver committee.

Our great national problem is not enough engineering teachers and not enough engineering students to carry on the nation's work. Also, we do not have enough engineering centers to assure the flow of new inventions.

Improved....



Series 63300 B

FISHER-PIERCE

PHOTOELECTRIC CONTROL

FOR STREET LIGHTING

This new Fisher-Pierce Control is the result of long experience in design and manufacture, combined with practical experience of more than 600 electric utilities in more than 20,000 installations.

The new 63300 B Control is mechanically and electrically interchangeable with existing controls. The same dependable Fisher-Pierce circuit, consistently giving tube life of more than 20,000 hours, has been retained. Improved spacing and insulation provides increased protection against lightning damage . . . up to 2500 volts rms Hipot. Mechanical design has been altered to provide maximum simplicity for greater economy of servicing.

The FISHER-PIERCE Co., Inc.

82 PEARL STREET, SO. BRAINTREE, BOSTON 85, MASS.

NEWS ABOUT PEOPLE

Pierce, Hickey Appointed to New Posts in NEES

Richard E. Pierce has been named a principal officer of four New England Electric System utilities in western Massachusetts—Northampton Electric Lighting Co; Northampton Gas Light Co; Northern Berkshire Gas Co, North Adams; and the Southern Berkshire Power & Electric Co, Great Barrington. He succeeds Chandler W. Jones who was transferred to the Narragansett Electric Co, Providence, R. I., as vice president. Pierce has been vice president and manager of the Northern Berkshire company since 1936.

R. E. PIERCE

T. J. HICKEY

In another promotion, Thomas J. Hickey, executive assistant with NEES at Boston since April, 1951, has been appointed vice president and director of the Lowell (Mass.) Electric Light Corp.

Pierce joined the Northampton Electric company in 1914 as a draftsman and served in various capacities in nearly all departments, becoming manager in 1931. He will make his headquarters at North Adams.

Hickey began his utility career in 1922 with the New England Telephone & Telegraph Co. In 1925 he entered the insurance business and in 1929 returned to the utility field as a salesman for Quincy (Mass.) Electric Light & Power Co. Eight months later he was made assistant to the sales manager and in 1931 was transferred to the Marlboro (Mass.) Electric Co as sales manager, becoming manager in 1934.

•

Thomas F. Barney has been appointed assistant general sales manager for the apparatus and supply division of Westinghouse Electric Supply Co. Formerly New England district apparatus and supply sales manager, Barney joined Westinghouse in 1936 as a salesman. He was appointed manager of the company's branch at Hartford, Conn., in 1945 after three years service in the Navy and became New England district manager in 1948.

Elmer A. Rothfus and **Millard C. Westrate** have been placed in charge, respectively, of distribution system engineering and of bulk power system engineering by Commonwealth Services, Inc, Jackson, Mich. Rothfus has been with Commonwealth since 1946 and previously worked for Westinghouse Electric Corp. Westrate recently returned to Commonwealth after resigning as superintendent of Public Works in Holland, Mich.

Hubert B. Elder has been appointed resident engineer of The Dalles Dam, to be built on the Columbia River by the Army Corps of Engineers. He has served as resident engineer on the Dale Hollow and Center Hill Dams in the Cumberland River Valley.

Ohio Edison Promotes Carnegie to New Post

Andrew Carnegie, general superintendent of power production for Ohio Edison Co since early this year, has been named manager of the utility's production and transmission department to succeed Frank W. Funk, vice president, who retired Dec. 1.

C. S. Bowden, general superintendent of substations and transmission since January, replaces Carnegie as power production superintendent. S. C. Hoover, superintendent of electric distribution in the Warren division of utility since 1948 succeeds Bowden.

ANDREW CARNEGIE

After serving with the Navy in World War I as an ensign, Carnegie went to work as a test engineer with Duquesne Light Co, Pittsburgh, Pa. In 1920 he joined a predecessor company of Ohio Edison as assistant superintendent of power. Ten years later, when Ohio Edison was formed, he was made superintendent of power plants, working out of the Akron office.

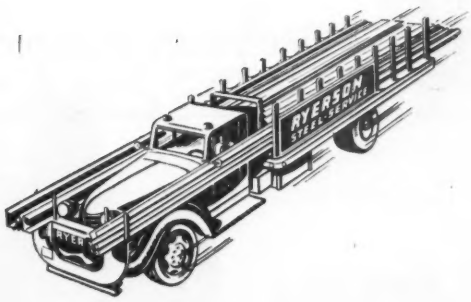
Bowden started his utility career in 1924 with City Light & Water Co Amarillo, Tex., as a results engineer and a year later came to Ohio Public Service Co. Sandusky, which was merged with Ohio Edison. He then became superintendent of distribution first in Ashland, and in 1933, in Alliance and in 1944 was made manager of the central engineering division of

RYERSON

Ryerson Steel Service awaits your call at thirteen great plants, strategically placed across the nation.

STEEL

Every kind of steel is on hand for quick delivery. Though stocks are currently unbalanced, most requirements are usually available.



SERVICE

Ryerson representatives are ready to assist you on any problem involving the purchase, fabrication or application of steel.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot and cold rolled, many types and coatings
TUBING—Seamless and welded, mechanical and boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated. Also tool steel
STAINLESS—Allegheny bars, plates, sheets, tubes, etc.
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

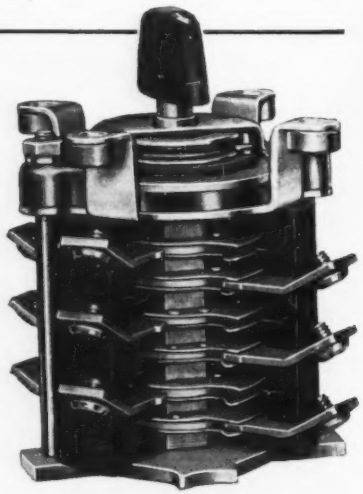
E ... Eliminates needless relays

S ... Simplifies wiring layout

C ... Conserves panel space

O ... One-point, multiple control

30-AMPERE TYPE-P ROTARY SNAP SWITCH



In all ESCO rotary switches, the make and break actions occur inside the insulating phenolic housings of the separate switch sections. These sections are ganged to provide the required number of poles.

Advantages: ESCO rotary switches combine great versatility of application with simplicity and ruggedness of design. In each individual switch section, a variety of rotor shapes and positions is possible. By ganging the required number of such sections, an almost unlimited choice of connection and operating sequence arrangements is available.

Ratings: The Type-JR rotary switch is rated at 10 amperes, 125 volts AC, or 5 amperes, 125 volts DC. The Type-P rotary switch — a high-speed snap-action switch — is available in these same ratings, and also in heavier designs for 30, 60, 100, or 200 amperes at 500 volts AC or 250 volts DC.

ESCO rotary switches can be furnished to meet the latest revised specifications of the Navy Department.

ELECTRO SWITCH
CORPORATION
167 King Avenue, Weymouth 88, Mass.

OPS in Elyria. In 1945 he was transferred to the OPS office in Cleveland as production manager.

Hoover joined OPS in 1924 and served in various engineering capacities in several communities served by the company. He was made distribution superintendent of the Port Clinton Division in 1930 and from there moved to Sandusky in the same capacity.

Funk, who has been vice president of Ohio Ed since 1949, first started with West Penn Power Co at Connellsville, Pa. in 1908 in the electrical construction department. He later worked for Westinghouse Electric Corp and Northern Ohio Traction & Light Co. In 1914 he joined the Penn-Ohio System, which later became part of Ohio Ed, in Youngstown as electrical engineer in charge of engineering and construction. From 1919 to 1925 he did consulting engineering work and returned to Penn-Ohio in 1926 as assistant general manager of its Youngstown properties. Following the consolidation of several utility companies into Ohio Ed, Funk returned to Akron in 1931 as chief engineer and manager of production transmission.

•

Ott Luhring, Charter Oak manager of Iowa Public Service Co, has been given the additional duties of manager of the Ida Grove district. **C. W. Foltz,** who has been Ida Grove manager, has resigned because of ill health. Luhring has been with the utility for more than 21 years, serving as district supervisor at Sheldon before becoming manager at Charter Oak.

Paul B. Wilson, Fresno, Calif., district manager for Pacific Gas & Electric Co. will retire at the end of the year. He joined a subsidiary company, San Joaquin Light & Power Corp, in 1909 and served as district agent in Paso Robles and district manager in Madera before being named Fresno district manager in 1922.

Arthur L. Williams, engineer of transmission and distribution design for the Los Angeles Department of Water & Power, has been promoted to assistant engineer of design construction. His appointment fills a vacancy caused by the promotion a year ago of **J. D. Laughlin** to engineer of design and construction. **E. L. Kanouse** succeeds Williams as engineer of transmission

and distribution. Kanouse, formerly transmission system engineer, has been replaced by his assistant, **E. G. Olmsted.**

•

Murray Appointed a VP by Appleton Electric Co

Edward A. Murray has joined Appleton Electric Co, Chicago, as vice president in charge of sales.

Before coming to Appleton, Murray worked about 17 years with the Ameri-

E. A. MURRAY

can Steel & Wire Co, a subsidiary of United States Steel Corp. He started as a sales correspondent and was manager of the entire Chicago sales district when he resigned to go with Appleton. His headquarters will be at the company's main factory in Chicago.

•

F. T. Schell, district manager in the Compton office of Southern California Edison Co, has been transferred to Fullerton as manager. The Fullerton manager, **C. E. Demarest,** replaces Schell at Compton.

Paul Koester has been elected president of the Panhandle Rural Electric Membership Association, Alliance, Neb. Other new officers are **Roland Powles,** vice president, and **Cecil Vickers,** secretary treasurer.

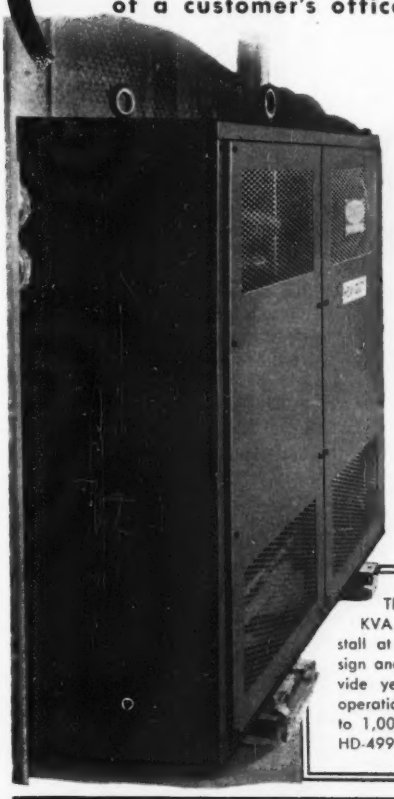
Jack K. Busby has been appointed general counsel for Pennsylvania Power & Light Co. He has been associated with the law firm of Simpson, Thacher & Bartlett, New York, since 1941 except for four years service in the Navy during World War II. The company also named **Clarence T. Shoch** assistant to the vice president, commercial department. He has been manager of industrial sales. **S. F. Dif-**

They Saved Time and Money, too!

Smart Utility Engineers Reduced Installation Costs and Secured Highly Satisfactory Results by placing this

HEVI DUTY DRY TYPE TRANSFORMER

in the unused storage space of a customer's office building



NO OUTDOOR PLATFORMS

NO EXPENSIVE VAULTS

This Hevi Duty 31FH, 225 KVA transformer, is easy to install at load centers. Liberal design and rugged construction provide years of quiet dependable operation. Other sizes from 1/4 to 1,000 KVA. Write for bulletin HD-499.

HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

Controlled HEAT FOR ALL TYPES OF SOLDERING

With 250-Watt WELLER GUN

No need to change tools for *light or heavy* soldering. The 250-watt Weller Soldering Gun does both with *controlled* dual heat. 5-second heating saves time and current on every job. Your Weller Gun pays for itself in a few months.

Check These Time-and-Money Saving Features

TRIGGER-SWITCH CONTROL—Governs heat for light or heavy work. Saves power because no need to unplug gun between jobs.

SOLDERLITE—Spotlights the work. Lets you see what you're doing at all times.

5-SECOND HEATING—No waiting, no wasted current. Saves hours and dollars each month.

LONGER REACH—Lets you get at any job with ease. Slides between wiring—into the tightest spots.

STREAMLINED—Compact and comfortable to hold. Pistol-balanced for fast precision soldering.

RIGID-TIP—Chisel-shaped. More soldering area for faster heat transfer. "Over-and-under" terminals give bracing action.

DUAL HEAT—Single heat 200 watts; dual heat 200/250 watts; 120 volts, 60 cycles.

See the new 250-watt Weller Soldering Gun today at your distributor—or write for bulletin direct.

SOLDERING GUIDE—Get your new copy of SOLDERING TIPS—revised, up-to-date and fully illustrated 20-page booklet of practical soldering suggestions. Price 10c at your distributor, or order direct.

WELLER ELECTRIC CORP.
817 Packer Street, Easton, Pa.

fenderfer, Lancaster division commercial manager, succeeds Shoch as industrial sales manager.

•

Helen Kirtland Is Named Head of Hotpoint Institute

Miss Helen Kirtland has been named manager of the Hotpoint Institute, by Hotpoint, Inc, Chicago.

Miss Kirtland will head a home economics staff as part of the company's merchandising department and

HELEN KIRTLAND

will be responsible for developing home service activities tied in closely with sales, engineering, and major retail accounts.

Entering the electric and gas appliance field in 1932, Miss Kirtland has served as home service director for a number of utility companies in the East and Midwest. Before joining Hotpoint, the institute's new manager was an associate editor of household equipment at "McCall's" magazine.

•

McDonald Ferry, former line foreman at Toledo, Iowa, for Iowa Electric Light & Power Co, has been appointed line superintendent for the Boone district. The utility also named **Arnold Best,** electrical engineer, Boone district electric and gas engineer.

Henry V. Ivory has been named plant manager of National Electric Products Corp's plant at Elizabeth, N. J. He formerly was in charge of mobilization planning at Picatinny Arsenal, New Jersey.

S. T. Ramey has been appointed sales promotion manager of Highway Trailer Co, Edgerton, Wis. He will have charge of the company's advertising, sales promotion, and public relations activities.

The only Protectors CURVED *for WORK!*

Only Bullseye Protectors have the built-in curve that allows *natural hand movements* — no wrinkles, no bunching! Tough horsehide is buffed for sure grip, even in wet weather. Write for information and prices.

UNIVERSAL LEATHER CO.
114 Pierce Street Berlin, Wis.

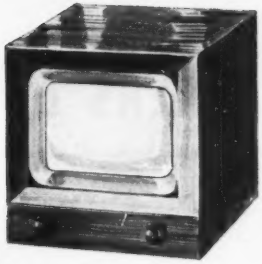
FOR HOT SURFACES

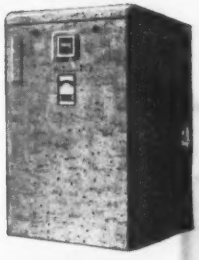
HEAT-REM H-170 *stays on where other* **Aluminum Paint** *paints burn off*

Silicone base fuses with surface metal. For heat lines, condensers, ovens, engine heads, mufflers, radiators, exhaust manifolds . . . all extra hot surfaces.

SPECO, Inc. 7308 Associate Ave. Cleveland 9, Ohio

BUY
all the U. S. Savings Bonds you can
and
KEEP
all the U. S. Savings Bonds you buy





How Many in 1952?

You can help maintain steel production . . . for military and civilian needs . . . by salvaging your iron and steel scrap—*now* and regularly.

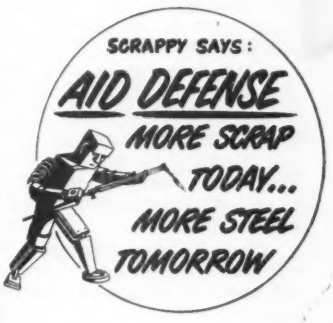
Steel mill productive capacity is being constantly increased, and we *can* meet military and civilian demands . . .

If we all pitch in and turn in our iron and steel *scrap*

Scrap is the scarce commodity. The amount of *working* scrap—the wastes of metal-working, such as trimmings, borings, etc.—is not enough for the enlarged furnace capacity.

It will take the *dormant* scrap to keep the furnaces running—old, outmoded machinery, equipment and parts that you've already "junked" or *can* junk because you have no further use for them.

We need extra millions of tons of scrap this year and next year. All of us can help by clearing out our plants and yards—*now*.



NON-FERROUS SCRAP IS NEEDED, TOO!

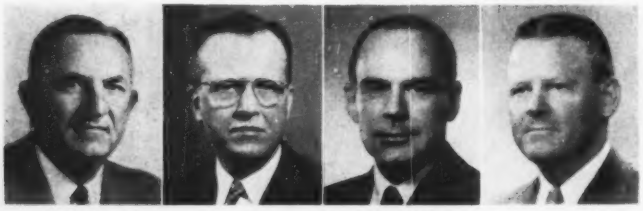
This advertisement is a contribution, in the national interest, by

McGRAW-HILL PUBLISHING COMPANY, INC.

330 WEST 42nd STREET NEW YORK 18, N. Y.

A PUBLIC SERVICE PROJECT THE ADVERTISING COUNCIL

MANUFACTURERS and MARKETS



R. A. CLARK D. B. WHITE H. C. GERSTER C. T. SHROPSHIRE

GE Supply Names Regional VP's . . .

NEW WAREHOUSE in Pittsburgh kicked off GESCorp's extensive building program

to General 3-Year Expansion Plan

Wholesale distributors will have to be able to put 50% more appliances and apparatus in their customers' hands when the mobilization spurt ends in 1954.

So Pres Charles Pritchard of General Electric Supply Corp believes. To meet the expected demand, he and his staff plan to reorganize the 7,000-man electrical distributing outfit under four regional vice presidents and set up new offices and warehouses by the handful.

"We don't want to wait until after the defense program is over," he said last week. "If we do, we won't be ready."

Pritchard and his lieutenants believe that if the present mobilization drive is completed on schedule within the next three years, many plants will be turned over to production of appliances and apparatus. They think a new housing and building program will start about the same time. GE Supply sold $500 million of General Electric, Hotpoint, and independently made products in fiscal 1950; the management expects it to sell $750 million in 1954.

"Of course," said Pritchard, "if all-out war comes, we'll have to scrap these plans and start over again. But for now, we're going ahead with the reorganization."

When it's completed, he explained, GE Supply will have 48 districts instead of 36, 200 wholesale houses instead of 127, and 1,000 top management personnel instead of 600.

"That last figure is a morale factor," the president commented. "It means we're going to have a lot of younger men in responsible jobs and coming up the line."

The district managers will be working under Charles T. Shropshire in the Northeast Region (Bridgeport), Donald B. White in the North Central Region (Chicago), Robert A. Clark in the Southeast-Southwest Region (Atlanta), and Harry C. Gerster in the Western Region (Los Angeles). Formerly, managers reported directly to the president. Each vice president will have administrative control of his region, and will supervise its expansion..

Serves 92% of United States

The company, which now serves about 92% of the United States, won't go into any new areas, but will increase coverage within its present territory.

"We're the largest electrical distributor in the world," Pritchard said, "but I don't like to stress size—I like to stress service. We intend to build new houses to put our supplies within reach of the small distributors. We're making the districts smaller, and putting more houses in them—the idea is to give each manager a territory he can put his two arms around."

The districts have been classified into four size groupings, based on the percentage of total U. S. sales that can be expected in any one area (Business Potential Index). "You can't approach the New York district the same way you can, say, Atlanta," the president observed.

Districts Subdivided

Each district will have an appliance side and a supply and apparatus side. The whole reorganization is aimed at a higher degree of specialization by salesmen. This is necessary because the company distributes hundreds of products ranging from electric irons up to 1,000-hp motors ("Anything electrical that does not need a large

amount of engineering application," Pritchard explains).

During the last year, GE Supply Corp did 5½ times as much business as it did in 1940. Was there any definite indication that the company would be doing half again as much in 1954?

"Well, let's look at the book," said the president. He leafed through the master plan of reorganization. "Our surveys indicate ranges will be up 47%, radio and television up 75 to 100%, and appliances in general up 80%."

He indicated he felt pretty safe with the 50% figure.

•

UE Accepts Wage Offer of General Electric Co

General Electric Co and the United Electrical Radio and Machine Workers of America, independent, have reached a wage agreement granting increases amounting to 3.58%.

The agreement grants a general wage rise of 2½% with a 3½¢ hourly minimum and a cost-of-living boost, based on the increase in the Bureau of Labor Statistics index between Mar. 15 to Sept. 15. The pay increase is retroactive to Sept. 15. The contract also provides for three weeks' vacation after 15 years' service and calls for a reopening of wage discussions in March. The settlement, which is subject to approval by the Wage Stabilization Board, is identical with that made by GE with more than sixty unions, including the International Union of Electrical Workers, CIO.

UE represents about 44,000 employees at 44 GE plants.

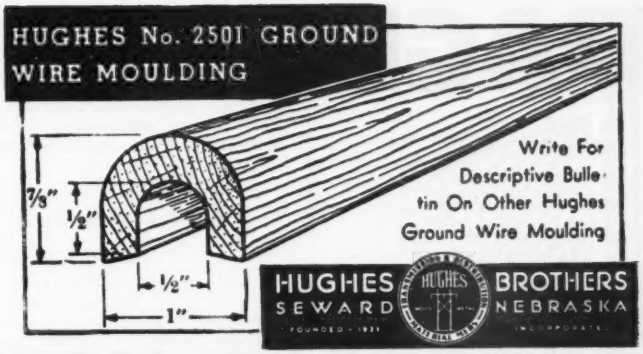
SALES ASSIGNMENTS

COMPANY STAFFS

Graybar Electric Co has appointed W. T. Bronson manager of its Lansing, Mich., branch. With the company since 1934, Bronson has been manager of inside and outside lighting sales at Detroit since last year.

Metal Prices
Dec. 10, 1951

COPPER, Conn., V., lb	5	.24½
LEAD, N. Y., lb		.19
ZINC, prime Western, E. St. Louis, lb		.19½
TIN, Straits, quol. N. Y., lb		1.03
ALUMINUM, ingot, base price		.19
NICKEL, base price		.56½
STEEL, billets, Pitts., ton		56.00
STEEL, scrap, No. 1 heavy, Pitts., ton		45.00



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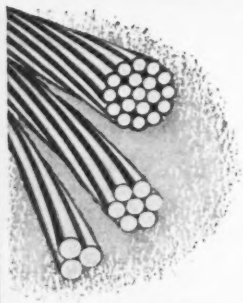

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NEW ELECTRICAL CONSTRUCTION

A weekly selection of U. S. electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is indicated or implied

UTILITIES

Proposed Construction

Arizona—Verde Electric Cooperative Cottonwood, 58 mi. rural distr. line and sys. improvs., Yavapai Co. $210,000.

California—Bureau Reclamation, Dpt. Interior, Bldg. 1-A, Denver Center, Denver, Colo., power transformers for Folsom Power Plant, Central Valley Proj., Spec. DS 3565. L. N. McClellan, ch. engr.

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, generator-voltage bus structure switchgear and protective equipment for Pole Hill Power Plant and Flatiron Power and Pumping Plant Colorado Big Thompson Proj. Spec. DS-3562.

Fla., Jacksonville—Office in Charge of Construction, Box 5, Bldg. 902, Naval Air Station, Jacksonville, steam condensate lines U. S. Naval Hospital, Naval Air Station for Sixth Naval Dist., Charleston, S. C. Plans dep. $10.

Fla., Tampa—U. S. Eng., P. O. Box 4970, Jacksonville, exten. power distr., MacDill Air Force Base, about 4 mi. southwest of here, Hillsborough Co., Serial No. Eng 08-123-52-80.

Ia., Ackley—City, Kathryn Grominga, clk., power plant imprvs. incl. dual fuel diesel engine generating unit, foundation auxiliaries, circulating pump, piping, wiring, switchgear, etc. Ralph W. Gearhard, 349 21 St. E. S. E., Cedar Rapids, engr.

Kentucky—U. S. Eng., 830 W. Broadway, Zone 3, 2 concrete substructure, brick superstructure walls pumping plant structures, misc. piping, valves, equipment, transformer sub-stations for pumping plants at Fourth and Buchanan Sts., CIV-ENG 15-029-52-61. Plans deposit $15.

Mass., Belmont—Town, Electric Light Dpt., 150 Concord Ave., electric power plant addn., Concord Ave. $400,000. Charles T. Main, Inc., 80 Federal St., Boston, consult. engr.

Mass., Falmouth—U. S. Eng., 857 Commonwealth Ave., Boston, transmitter and receiver bldg., Otis Air Force Field, Eng. 19-016-52-17. $65,000. Plans deposit $10.

Mich., White Pine—White Pine Copper Co., subsidiary of Copper Range Co., 24 Federal St., Boston, Mass., power plant, Stone & Webster Engineering Corp., 90 Broad St., New York 4, N. Y., engr.; mine, mill and smelter for production of metallic copper, Western Knapp Engineering Co., 760 Folsom St., San Francisco, Calif., engr. Total est. cost $47,000,000. Turner Constr. Co., 420 Lexington Ave., New York 17, N. Y. will be management and construction contractors when project goes ahead.

Miss., Lyons—Coahoma Electric Power Assn., Clarksdale, warehouse and office, $120,000, Biggs, Weir & Chandler, 224 N. Congress St., Jackson, archts.

Montana—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Colo., furnishing, del. f.o.b. cars at shipping point or f.o.b. cars Glendive, control board for Dawson Co. sub-station; set of unmounted line protective and carrier-current relaying transmitter-receiver set with line tuning unit for Miles City line at Dawson Co. sub-station; carrier-current relaying transmitter-receiver set with line tuning unit for Dawson Co. line at Miles City sub-station, set of unmounted line protective and carrier-current relays for Williston line, misc. relays for Fort Peck line at Dawson Co. sub-station, carrier-current relaying transmitter-receiver set with line tuning unit for Williston line at Dawson Co. sub-station, set of unmounted relays for Dawson Co. line at Williston sub-station, Fort Peck Proj. Montana-North Dakota, Spec. 3601, L. N. McClellan, ch. engr.

N. Y., New York—Bd. Water Supply, 120 Wall St., Zone 5, Contr. 428, furnishing, testing, del. two 60 in. e.l. motor-operated butterfly type valves, complete in every respect for installation in Downsville release water chamber of Delaware Aqueduct.

Oregon—Bonneville Power Admin., 827 N. E. Oregon St., Portland, clear right of way for Schedule VII 15.1 mi. Redmond-Klamath Falls 230 kv transmission line, Inv. 6181, Klamath Co. Plans deposit $1.

Oregon-Washington—U. S. Eng., 628 Pittock Block, Portland, Zone 5, excavation for cellular cofferdam, powerhouse, forebay and the diversion channel; construct rock fill cofferdam, removal of overburden, construct impervious zones, filter blankets transition and dumped rock zones and placement of rock revetment, construct steel sheet pile cells, placing gravel fill and revetment in cells and installing seal (sand and cement in bags) construction, installing and operating pumping facilities for underwatering the powerhouse cofferdam, for the The Dalles Dam, Inv. No. CIVENG 55-062-52-123. Est. $10,000,000.

Pa., Philipsburg—Civil Aeronautics Admin., Dpt. Commerce, Federal Bldg., New York International Airport, Jamaica, 8x12 ft. power shed, installing standby engine-generator and other related construction and electrical work for INSAC Station, Proposal No. 152-85-4131.

S. C., North Augusta—South Carolina Electric & Gas Co., 1321 Main St., Columbia, electric generating plant, $45,000,000.

South Dakota—Bureau Reclamation, Dpt. Interior, Huron, Summit Sub-station, Spec. No. DC-3605; Brookings Sub-station, Spec. No. DC-3603; Groton Sub-station, Spec. No. DC-3604, Transmission Div., Missouri River Basin Proj.

Texas—Coleman County Rural Electric Co-operative, Coleman, 61 mi. rural distr. lines, sys. imprvs. and completion previously approved construction, Coleman Co. $160,000.

Vt., Burlington—City, City Hall, generating plant, $4,000,000. Pierce Consulting Engr. Co., 183 Essex St., Boston, Mass. consult. engr.

Mexico—Federal Electric Comn., c/o Dpt. Gov. P. Wks., Mexico City, Mexico, plans electric power plants, at Sonora, $1,500,000; Actopan, $375,000; Ciudad Victoria, $250,000.

Ont., Oakville—Town, C. H. Byers, clk., Colborne St., exten., imprv. electrical sys., $100,000.

Low Bidders & Contracts Awarded

Georgia-South Carolina—Cleveland Electric Co., Manning, Jacksonville, Fla., LB, $280,855, 115 kv switchyard for Clark Hill Dam Powerhouse, Clark Hill Proj., Savannah River Basin, Serial No. CIV-ENG 09-133-52-28. U. S. Eng., Post Office Bldg., Savannah, Ga. Bids Nov. 27.

Minn., Aurora—Minnesota Power Light Co., 30 W. Superior St., Duluth, Minn. Own Forces. Total $12,000,000. steam plant, Ebasco Services, Inc., 2 Rector St., New York 6, N. Y., engr.

N. J., Phillipsburg—United Engineers & Constructors, Inc., 1401 Arch St., Phila., Pa. CA $1,501,129. design and construct turbine and pump plant. Ingersoll-Rand Co., Phillipsburg, N. J.

Texas—West Texas Utilities Co., Abilene, Tex., Force Account. $85,000. electric power transmission lines, Tom Green Co.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Del., Cheswold—International Latex Corp., Dover, Del., first unit textile mfg. plant Approx. $1,000,000. Fred Andrews, ch. engr.

La., Lake Charles—Cities Service Co., Lake Charles, 25,000 bbl. daily increased expansion refinery, $26,650,000.

Mass., West Chelmsford—Shea Chemical Co., West Chelmsford, chemical plant, $2,100,000 incl. equip.

N. Y., Schenectady—U. S. Eng., 80 Lafayette St., New York, Zone 13, addnl. facilities at Schenectady General Depot. $10,000,000. Plans deposit $40.

Pa., York—Caterpillar Tractor Co., 600 W. Washington St., East Peoria, Ill., bought 190 acre site for 360,000 sq. ft. truck parts plant, $3,000,000.

Tex., Houston—Peter Pan Baking Co., 12 and Jackson Sts., bakery plant, Griggs Rd. $2,750,000.

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Corrosion Engineers with minimum of three or four years experience in corrosion investigations and design of cathodic protection on pipe lines and lead cables in country and city networks. Must be graduate electrical engineer (or equivalent). Work involves extensive travel, with headquarters in New York City. Only applicants with above qualifications will be considered. Give full details of education and experience, and references, in application.

P-2544, Electrical World
330 W. 42 St., New York 18, N. Y.

LIGHTING ENGINEER

Experienced lighting engineer, capable design, selection and application of lighting for generating plants, electric substations, industrial plants and office buildings. Applicant should be qualified or interested in training for handling of all technical problems related to lighting engineering. Location, New York City. Please furnish complete information including age, education and experience record.

P-2553, Electrical World
330 W. 42 St., New York 18, N. Y.

WANTED: Experienced Power Station Engineer.
POSITION: Assistant to Manager of Power Production with administrative responsibility of operating central stations totaling approximately 800,000 kw.
LOCATION: Pennsylvania.
ADVANCEMENT: Excellent for growth on job and promotion in near future.
EXPERIENCE: 10 years minimum, with at least 5 years in operation, maintenance or efficiency work in large modern steam-electric central station. Construction and design experience will be considered.
EDUCATION: B.S. degree in Mechanical (preferred) or Electrical Engineering from an accredited engineering college.
AGE: 30-45.

Salary commensurate with qualifications

All applications will be acknowledged. Please send personal record to

P-2130, Electrical World
330 W. 42 St., New York 18, N. Y.

GENERAL MANAGER

OPERATING UTILITY COMPANY

Rapidly expanding highly rated western operating electric utility serving 120,000 customers has very promising opening for general manager between 38 and 45 with background of broad experience and accomplishment in principal field and general departments. Annual salary $15,000 to $20,000. Submit complete record of education and experience. All replies confidential.

P-2686, Electrical World
68 Post St., San Francisco 4, Calif.

GENERAL ENGINEER

ELECTRICAL GRADUATE

Experienced in application of relays, control and power apparatus to Central Stations and Substations by established consulting organization for work in a continuing program of plant expansion for foreign public utility companies. Applicants should be capable of making short circuit, stability, calculating board studies, as well as doing a limited amount of estimating and design work and specification writing for related electrical equipment. Permanent position, location New York. Limited foreign travel. Attractive salary. Splendid opportunity for right man. Reply, stating age and fullest detail of qualifications and experience.

P-2415, Electrical World
330 W. 42 St., New York 18, N. Y.

WANTED

SALESMAN or AGENCY

Experienced in sale of power and distribution transformers for Chicago district

SW-1778, Electrical World
330 W. 42 St., New York 18, N. Y.

TRANSFORMERS

STOCK SHIPMENT
1 KVA—7500 KVA
—SPECIAL—
100 15 KVA Air 440/220 - 110/220
CASH FOR YOUR SURPLUS

ELECTRIC EQUIPMENT CO.
P. O. Box 51, Rochester, N.Y.
WORLD'S LARGEST INVENTORY
MOTORS • GENERATORS • TRANSFORMERS

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

ELECTRICAL ENGINEER—For research and development work in New York firm. Minimum requirement M.S. in E.E. or equivalent. Investigatory work on low voltage switchgear, circuit breakers and related equipment. Salary open. P-2324, Electrical World.

ELECTRICAL HEATING Specialist. Opportunity with stable, mid-western utility situated in thriving industrial area. Requires experience in promoting application of electrical heating in industrial plants. No traveling. Salary commensurate with ability. Submit resume of education, experience and personal data to P-2282, Electrical World, 520 N. Michigan Avenue, Chicago, Illinois.

MANAGER, COMBINATION Utility — predominantly electric, administrative and sales ability important, technical background desirable. Permanent position and substantial opportunity for qualified person. Replies confidential. Submit complete details including salary requirements. P-2466, Electrical World

POWER ENGINEER—Mechanical or Electrical Engineering graduate with a minimum of fifteen years' experience, of which at least five years must have been in responsible charge of the design, operation and maintenance of industrial steam and electrical generation and distribution facilities, refrigeration and air conditioning equipment, water supply and water treatment, industrial electrical control facilities and instrumentation. Position requires a man who is well grounded technically, cost conscious, experienced in industrial relations, capable of dealing effectively and harmoniously with associates, and capable of immediately assuming responsibility. Age, preferably between 35 and 45 years. Salary, dependent upon qualifications. Location, upstate New York. Send complete resume to P-2699, Electrical World.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

ELECTRICAL ENGINEER, graduate, experienced in switchgear and transformer design, and electrical utility design and planning. Fine record of responsible accomplishment. PW-2686, Electrical World.

ENGINEER — SENIOR Electrical, extensive utility power system design, construction, operating and maintenance experience. Desires responsible position with private or public utility or manufacturing Co. Best references. PW-2647, Electrical World.

WANTED

WANTED FOR CASH

ELECTRIC MOTORS — STARTERS
TRANSFORMERS — OIL & AIR BRKRS.
WIRE — CABLE — WIRING MATERIALS
SEND LISTINGS

ALLIED ELECTRIC & MACHINERY CO.
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Memphis, 1, Tenn.

BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES
No lengths too long or too short
Telephone: Ecstgate 7-4778
PIERCE CABLE CO.
2670 Clybourne Ave. Chicago 14, Illinois

SUBSTATION EQUIPMENT

TRANSFORMERS

Qu.	KVA	MFR.	VOLTAGE
3	3333	West.	132000—7620/13200 Y
4	2000	West.	69000—13800
4	2500	West.	44000—11000
3	1500	Wag.	44000—6900 NEW
3	200	Mol.	44000/22000—440/220
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
3	8333	West.	43800—13900
1	18750	A.B.B.	34840—11000, 3 ph.
6	1500	Pitts.	33000—2400
3	200	West.	33000—2400
1	150	G. E.	33000—7200/12470 Y
3	100	A. C.	33000—7200/12470 Y
3	75	Mol.	33000—2300/6900
3	75	Wag.	33000—7200/12470 Y
3	50	G. E.	33000—2300/4000 Y
3	50	Kuhl.	33000—7200/12470 Y
4	450	A. C.	25410/44000—13280/23000
3	50	West.	22000—2300
2	667	Pitts.	13200—2200
3	200	Mol.	11000—2300
3	150	Mol.	7620/13200 Y—120/240
3	667	Kuhl.	7200/12470 Y—2400
3	100	West.	7200/12470 Y—2400
4	50	G. E.	7200/12470 Y—2300
3	150	Wag.	6900—2300
1	100	G. E.	2300—575, 3 ph.
1	37½	G. E.	230/460—115/230

INDUCTION REGULATORS

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
2—46 KVA West. 200/400 A. 2300 V.
6—36 KVA G. E. 150 A. 2400 V.
2—36 KVA G. E. 75/150 A. 4800 V.

CIRCUIT BREAKERS

4—600 A. 154 KV G. E. FHKO- 39–2500 MVA
1—600 A. 73 KV G. E. FHKO-239– 500 MVA
1—400 A. 37 KV G. E. FHKO-136– 350 MVA
1—400 A. 37 KV West. O-221–500 MVA
1—400 A. 15 KV G. E. FKO-37–40
4—600 A. 15 KV G. E. FHKO-139– 750 MVA

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

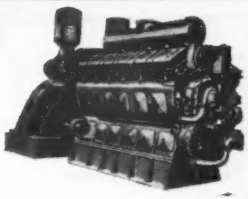
DIESEL POWER

FOR
IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA

A.C.—50 AND 60 CYCLES

VARIOUS VOLTAGES



A PARTIAL LISTING OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1875	Fairbanks Morse	33F16	2000	900	375	Enterprise	DSG-6	450	450
1420	Fairbanks Mors	38D8⅛	1600	720	330	Superior	KNA	396	514
1250	General Motors	16–278A	1600	720	312	General Motors	8–268A	450	1200
937 & 625	General Motors	12–567	1080	720	312	Clark	MD–4	375	327
625	Alco	6–12¼x13T	750	600	125	Ingersoll Rand	S	225	514
425	Baldwin	V–O–6	510	450	187	General Motors	3–268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6043C	90	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1—	6000	Al. Ch.	Condensing 200/250 I.S.P. 2300 v. 3/60 Exc. & Surface Cond.
2—	750	G.E.	Condensing — 425 lbs. 750 T.T. I.S.P. 440v. 3 ph. 60 cy.—Built 1944
1—	500	Moore	Non-condensing, 150/200 lbs ISP 5/35 lbs. G.B.P. 3/60/480 volts Direct Connected Exciter
1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P.—240/480 v. 3 ph. 60 cy.
1—	300	G.E.	Non-condensing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E	500	666.25 cy.	11000
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
1—	1000	G.E.	900	260	4160/6900
2—	500	Whse.	900	250	6900/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	240	G.E.	1200	250	2300
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	275	2300
1—	140	Cr. Wh.	690	125/250	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—4000	G.E.	HT	3	22000x2300
3—1500	Pitts.	OISC	1	22000-2300
3—1250	G.E.	HVDDJ	1	6600x250
3— 500	A.C.	OISC	1	13200 2300
6— 300	G.E.	HT	3	2400x240/480

BELYEA COMPANY, INC.
OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

TRANSFORMERS
FOR SALE

1 Phase, 60 Cycle

3—500 KVA G-E 66000—2300
2—500 KVA W-H 13200—240/480
3—400 KVA W-H 13200—600/575/550
1—400 KVA G-E 13200—120/240 Pyramol
3—333 KVA G-E 44000—6600
3—250 KVA W-H 13800—2300
3—200 KVA G-E 13200—120/240
3—250 KVA Kuhl 6600—575
3—150 KVA G-E 44000/33000—2400/500
3—150 KVA Pitts 22000—575
3—150 KVA G-E 19050/33000Y—2540/2300
3—150 KVA A-Ch 13800—2300
3—100 KVA G-E 33000—6900/11850Y
3— 50 KVA G-E 33000—2400/4160Y
3—100 KVA G-E 2400—240/480, 25 cycle

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
CINCINNATI 27, OHIO

New and Used Equipment Available for
POWER PLANTS, SUBSTATIONS, TRANSMISSION LINES AND CONSTRUCTION
Send for new list to
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TRANSFORMERS

1—1500 KVA Whse., 3 Ph., 31,000/66,000-240/480V, HT tapp.
3—1500 KVA Pittsburgh, 1 Ph., 22,000-2200V
1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
2—400 KVA Pittsburgh, 1 Ph., 2400/4800-240/480 Scott-Taps
3—400 KVA G.E., 1 Ph., 6900V 2300V Sec.
1—200 KVA G.E., 3 Ph., 2400-220 Sec.
2— 50 KVA Whse., 1 Ph., 2400V 120/240 Inerteen
6— 50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.

SYNCHRONOUS MOTORS

1—300 H.P., Elec. Mach., 720 RPM, 3 Phase 60 cyc., 2200V. Totally Enclosed Fan Cooled Outdoor service.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4000V Syn.
1— 200 KW Whse., 275V, 900 R.P.M., 220 V. Sys.
1— 176 KVA West., 1 Ph., 220V. Motor 3 Ph., 400V.
1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Sym.
1— 75 KW., 250V, 1200 RPM., 2400V, Syn.

SLIP RING MOTORS

1—2500 HP G.E., MT, 257 RPM 6600V.
1— 250 HP West., CW, 600 RPM, 440V.

SYNCHRONOUS CONDENSER

1—2500 KVA Whse., 720 RPM, 2200V with D.C. Exc

Large Stock of A.C. and D.C. Equipment

NEW "SEARCHLIGHT" ADVERTISEMENTS
received by 10:00 A.M. Dec. 20th will appear in the Dec. 31st issue subject to space limitations.
Classified Advertising Division
ELECTRICAL WORLD
330 W. 42nd St., New York 18, N. Y.

METERS

260 ea.—G.E. Type I-14, 5 amp. 110 volt, 60 cycle, 2 wire meters with glass covers, completely overhauled & calibrated since removal, 90 day guarantee, $3.50 ea. in lots of four, f.o.b. Rockville Centre, N.Y. Contact Commissioner of Public Utilities.

ELECTRIC CABLE

- for every industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular supplier.
- Cut to length. Reasonably priced.

UNIVERSAL Wire and Cable Co.
2870 N. Clybourn Ave. Chicago 14, Ill.

LETTERS TO THE EDITOR

The Big Utilities

To the Editor:

I am reminded of the story about the elephant and the six blind men by the attractive spread in the October 29 issue of Electrical World, in which you describe "The Big Utilities."

To get more specific, it's certainly not a fair depiction of the American Gas and Electric System to break it down into its three major parts. For one very good reason, only two of the three important parts of the AG&E System show up in the tally. For a second very good reason, The Ohio Power Company and the Appalachian Electric Power Company are parts of the AG&E System, and even though for accounting, commission, and other reasons these companies must be presented separately, they couldn't possibly operate alone because of the tightly-knit, integrated system to which they belong.

No more can the total plant capacity of these companies be presented individually than can the foreign policy of the United States be presented piecemeal, state by state, as the policy affects and is affected by those states.

Ours, of course, is not the only system operation that is not properly appraised because of the individual company approach that you've made to the problem. To name but a few, there are the West Penn Electric Company, the Southern Company, and Middle South Utilities.

While I realize there's plenty of reason on your part for the manner in which the individual operating companies have been presented, couldn't all sides of the matter be taken care of by a very simple device? Under each classification, as you now present them, list the first ten individual operating companies, and then list the first five or six power system in each category. With the emphasis on size and bigness as denoted by the title of the article, I should think this would be indicated.

The next few years will see many changes in the ranking of the country's leading power systems. It's only fair that a leading industry publication such as Electrical World properly report those changes for all to see and understand.

Harold A. Smith
Associate Director of Public Relations
American Gas & Electric Service Corp
New York, N. Y.

Editor's note: Electrical World has gathered these statistics of registered holding companies. They are based on the 1951 edition of Moody's Public Utilities.

Customers

		Rank*
American Gas & Electric Co.	1,147,128	4
Southern Co.	938,101	9
General Public Utilities Corp.**	807,662	11
New England Electric System	686,669	13
Middle South Utilities	670,446	14

Electric Operating Revenues

American Gas & Electric Co.	$167,075,525	2
Southern Co.	127,080,582	9
General Public Utilities Corp.	105,438,683	10
New England Electric Service	87,334,844	12
Middle South Utilities	73,303,377	15

Total Capacity (kw)

American Gas & Electric Co.	2,508,376	2
North American Co.	1,165,188	10
General Public Utilities Corp.	1,124,140	11
West Penn Electric Co.	1,117,150	12
Middle South Utilities	916,145	15

Total Generation (1,000 kwhr)

American Gas & Electric Co.	13,563,697	1
Southern Co.	10,471,086	5
West Penn Electric Co.	6,078,555	12
General Public Utilities Corp.	5,680,713	14
North American Co.	5,319,066	15

* Position which system would occupy if included in "The Big Utilities" listing.
** Data do not include Philippine subsidiaries

Camera Captures Power-Follow Current

To the Editor:

I took this time exposure during a brilliant lightning display one night last August while vacationing in Tampa, Florida. I was surprised to find that the picture included an apparent power line flashover, as can be seen in the lower right-hand corner of the picture. I wish to assure the power company that this was entirely coincidental and not staged by me.

C. A. Gruenwald
144 S. Butrick Street
Waukegan, Illinois

Some Names Are Missing

To the Editor:

You are to be congratulated on the compilation "Trade Marks and Trade Names" in the November 5 issue of Electrical World. It is a very worthwhile item and one for which there has been need for some time.

In checking against our own list, however, we find some items not included in your compilation. A tabulation of these omissions is attached.

E. G. Driscoll
Design Engineer
Phelps Dodge Copper Products Corp
Habirshaw Cable and Wire Division
Yonkers, New York

Editor's note: Reader Driscoll's list is being included in a supplemental listing to be published in the future.

Your Best Buy

THE

"MK-40"

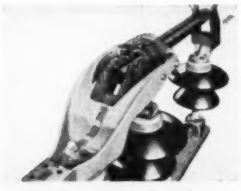
The Standard of Comparison

Universal acceptance by operating engineers is abundant proof of the sound engineering principle incorporated in the design.

Its simplified construction and improved high pressure contacts at both ends of the blade insure the highest mechanical and electrical performance under the most severe weather and service conditions.

You can select a Delta-Star group-operated "MK-40" switch for every type of service, from 7.5 thru 230-kv and current ratings to 5000 amperes.

Delta-Star 69-kv. 600 amp. "MK-40" air switch



CURRENT PATH

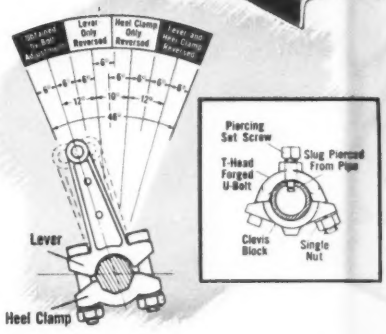
From terminal to terminal the number of current interchange surfaces is reduced to an absolute minimum. Both ends of the floating tubular blade have the same type of reliable high pressure contacts backed by independent pressure applying members. There are no other moving contact surfaces or springs. Everything is in plain view for visual inspection.

BLADE MECHANISM

Fully controlled blade is actuated by a 45-degree bearing mechanism which replaces cranks, levers, links and cams. It converts motion of operating insulator to a vertical lifting and rotating motion of the blade, with a smooth sequence and just the right mechanical advantage. Blade locks automatically in both opened and closed positions.

CONTACTS

Current carrying function of the contacts is independent of the pressure applying members to take full advantage of the electrical and mechanical characteristics of the materials used. Hard drawn copper shoes have heavy silver inlays. Ample material for heat dissipation assures high thermal conductivity. Uniform contact pressure is maintained by long, beryllium copper springs which carry no current.



OPERATING MECHANISM

Switch and control bearings have greaseless non-rusting ball bearings—insure free operation under all weather conditions. Self-piercing set screws on clamp type U-bolt fittings eliminate threading and drilling of pipe. Completely adjustable lever can be installed or removed without disturbing rotating insulator.

WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHES SPECIFY THE "MK-40"

DELTA-STAR ELECTRIC COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

2437 Fulton Street • Chicago 12, Illinois

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NONPAREIL TRADE MARK **Turbine Oil**

For economy in the long run

IN the case of two 12,500-KW turbines serving a midwest utility, the "long run" already has covered fifteen years. During that period, the original fills of NONPAREIL Turbine Oil have maintained an acidity below .10 mg. KOH/gm., with never any need to remove the oil for treating or for cleaning of the turbine lubricating systems. That's lubrication economy!

There's no time limit on the "long run," however, when NONPAREIL Turbine Oil is used. A written guarantee—given with each fill of NONPAREIL—is your assurance that it will last as long as your turbine.

For economy in your own turbine lubrication, make your next fill NONPAREIL. Let a Standard Oil lubrication specialist show you the facts, including service records covering up to twenty-three years continuous operation of NONPAREIL Turbine Oil. Contact your nearest Standard Oil Company office. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.

STANDARD OIL COMPANY STANDARD *(Indiana)*